MWH
MONTGOMERY WATSON HARZA

February 24, 2004

Kevin Adler, RPM
Mail Code SR-6J
U.S. Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590



Re: Work Plan for In-situ Remediation via Chemical Oxidation
South Area near Colfax Avenue and Reder Road
American Chemical Service (ACS) National Priorities List (NPL) Site
Griffith, Indiana

Dear Kevin:

The Phase 3 Investigation Report for the South Area Oxygen Release Compound (ORC) Pilot Study (Phase 3 Report) was recently submitted for your review. The report summarized the findings from the upper aquifer source area investigation and recommended proceeding with an in-situ Chemical Oxidation (Chem-Ox) program to remediate the residual upper aquifer contamination source area that has been identified near the intersection of Colfax Avenue and Reder Road. This area is known as the South Area and it is shown on Figure 1 of the attached Work Plan.

The attached Work Plan is being provided for your review and comment. It is the plan for conducting a Treatability Study to develop design parameters for the Chem-Ox remedial program in the South Area.

The results of the Phase 3 Report indicated that just outside of the barrier wall in the South Area, residual organic material existed in a three to six-foot interval across the water table interface. This interval showed some dark staining and occasionally contained small amounts of oily material. We have interpreted this as a "smear zone" that likely developed during the time that the Kapica-Pazmey site was in operation. Contaminants that were released by Kapica appear to have accumulated on the water table. As the water table rose and fell during the annual hydrograph, the free product was "smeared" into the pore spaces between the highest and lowest water table elevations.

The soil samples collected from this smear zone yielded elevated concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX) as well as gasoline range and diesel range organics (GROs and DROs). The investigation report concluded that these organic contaminants in the smear zone are the source for the VOC-impacted groundwater

extending south and southeast of the site. The Phase 3 Report found that application of ORC was not sufficiently aggressive to destroy the source area, and it recommended applying Chem-Ox to treat organic contaminants in this smear zone.

The Chem-Ox remediation concept is to inject a strong oxidizing agent into the source zone to destroy it. Fenton's reagent, a mixture of hydrogen peroxide and ferrous iron, is a common substance used for Chem-Ox remediation in soil and groundwater. Hydrogen peroxide is the oxidizer and ferrous iron acts as a catalyst. The catalyst converts the oxidizer into hydroxyl radicals, which in turn oxidize petroleum hydrocarbon contaminants to carbon dioxide and water. Chem-Ox remediation is essentially a "brute force" method of in-situ remediation. Fenton's reagent will be effective in converting the organic contaminant sources typical of the ACS Site into harmless by-products of carbon dioxide and water when they come into contact.

However, there are some limitations in using a simple Fenton's reagent. In order to be effective, the Fenton's reagent needs to disperse into the aquifer or soil matrix and reach the contaminants while it is still active. MWH proposes to retain In-situ Oxidative Technologies, Inc. (ISOTEC) of West Windsor, New Jersey as the vendor of a modified Fenton's Reagent formulation for the ACS South Area. ISOTEC has developed their proprietary formulation to overcome the shortcomings of the standard Fenton's Reagent by adding catalysts, chelating agents, viscosity enhancers, and mobility control agents. These additional components help control reaction time and lengthen the active lifespan, allowing the oxidizer/catalyst mixture to be distributed further into the targeted area. The process can be used on a variety of soil types and grain sizes, including silts and clays, and it has been used successfully in remediating sites contaminated with VOCs, semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs).

MWH proposes to implement the Chem-Ox remedy in several steps in order to optimize the efficiency of the program. The first step will be a Treatability Study[1] to determine the optimal mix of reagent, catalysts, and other additives to treat the source material and to determine appropriate injection volumes and borehole spacing. The results from the treatability study will be used to design a full-scale Chem-Ox application across the source zone. The full-scale application will be followed by an evaluation of its effectiveness and then additional applications will be performed as necessary to reduce the source zone to acceptable levels. It is not uncommon for a Chem-Ox remedy to consist of three or even more applications.

The attached Work Plan provides the scope of work for conducting the Treatability Study for Chem-Ox treatment of the smear-zone source in the South Area at the ACS Site. The Work Plan will be supplemented with the Quality Assurance Project Plan (QAPP), Site

[1] Often, a Treatability Study addresses only a small part of the target treatment area. However, in this case, the actually treatment area is relatively small, a total of less than 100,000 cubic feet. The Treatability Study proposed in the attached Work Plan will be treating 50,000 cubic feet, approximately 50 percent of the total target area. Therefore, the Treatability study will be of the same general magnitude as the full-scale application which will follow it. The objective is to optimize the reagent mix, and better target the residual organics in the full-scale application.

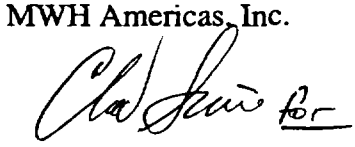
Safety Plan (SSP), the long-term Groundwater Monitoring Plan (LTGMP) and the associated Field Sampling Plan (FSP). (U.S. EPA and IDEM have already approved the QAPP, SSP, LTGMP, and FSP). A task-specific health and safety protocol is included as part of this Work Plan.

MWH will use the Treatability Study to design the full scale Chem-Ox Program for the ACS South Area. Following completion of the Treatability Study, MWH will develop the design for the full scale Chem-Ox program and submit it to U.S. EPA and IDEM for review, comment and approval.

We look forward to your review and comment on this Work Plan for the Treatability Study. If you have any questions or comments, please do not hesitate to contact me.

Sincerely,

MWH Americas, Inc.



Peter J. Vagt, Ph.D. CPG
Vice President

Attachments: Work Plan for In-Situ Remediation via Chemical Oxidation

cc: P. Kasarabada, IDEM
L. Campbell, Black & Veatch
B. Magel, Karaganis, White, and Magel

CAS/PJV/emp/jmf
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# WORK PLAN FOR IN-SITU REMEDIATION VIA CHEMICAL OXIDATION SOUTH AREA NEAR COLFAX AVENUE AND REDER ROAD

**AMERICAN CHEMICAL SERVICE, INC.**
**NPL SITE**
**GRIFFITH, INDIANA**

MWH File No. 2090601

Prepared For:

American Chemical Service NPL Site
RD/RA Executive Committee
Griffith, Indiana

Prepared By:

MWH, Inc.
175 West Jackson Blvd, Suite 1900
Chicago, Illinois 60604

February 2004

MWH

# WORK PLAN FOR IN-SITU REMEDIATION VIA CHEMICAL OXIDATION SOUTH AREA NEAR COLFAX AVENUE AND REDER ROAD

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Prepared For:

American Chemical Service NPL Site
RD/RA Executive Committee
Griffith, Indiana

Prepared by: _____ 5/21/04
Chad A. Smith, P.G. — Date
Professional Hydrogeologist

_____ 5/21/04
Matthew B. Mesarch, Ph.D. — Date
Engineer

Approved by: _____ for 5/21/04
Peter Vagt, Ph.D., CPG — Date
Vice President

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACS | American Chemical Services, Inc. |
| amsl | Above mean sea level |
| BETX | Benzene, ethylbenzene, toluene, and xylenes |
| bgs | below ground surface |
| Chem-Ox | Chemical Oxidation |
| °C | Degrees Celcius |
| DRO | Diesel Range Organics |
| DPT | Direct push technology |
| GRO | Gasoline Range Organics |
| IDEM | Indiana Department of Environmental Management |
| LTGMP | Long Term Groundwater Monitoring Plan |
| µg/kg | Microgram per kilogram |
| NPL | National Priorities List |
| ORC | Oxygen Release Compound® |
| PCB | Polychlorinated biphenyls |
| PID | Photo-ionization detector |
| psi | Pounds per square inch |
| PVC | Poly-vinyl chloride |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RD/RA | Remedial Design/Remedial Action |
| South Area | Area extending south and east of Site |
| SOP | Specific Operating Procedure |
| SVOC | Semi-volatile organic compound |
| TDS | Total Dissolved Solids |
| TOC | Total Organic Carbon |
| U.S. EPA | United States Environmental Protection Agency |
| USCS | United Soil Classification System |
| VOC | Volatile organic compound |

# 1.0 INTRODUCTION

The "*Phase 3 Investigation Report, South Area Oxygen Release Compound (ORC) Pilot Study*" (Phase 3 Report; MWH, September 2003) summarized the findings from the upper aquifer source area investigation. The purpose of the investigation was to identify the source of the benzene and chloroethane plume extending south of the ACS site in the upper aquifer.

The Phase 3 Report identified the source as a thin zone (three to six feet thick) of residual organic material across the water table interface just outside the barrier wall in the area near the intersection of Colfax Avenue and Reder Road (Figure 1). MWH has interpreted this as a "smear zone" that likely developed during the time that the Kapica-Pazmey site was in operation. Contaminants that were released by Kapica appear to have migrated to the southeast and accumulated on the water table. As the water table rose and fell during the annual hydrograph, the free product was "smeared" into the pore spaces between the highest and lowest water table elevations. Free product no longer shows up floating on the water table. Instead, it exists as residual organic material trapped in the pore spaces near the water table interface in the upper aquifer in this area.

During the winter and spring each year, the water table is high and in contact with the smear zone. During late summer and fall, the water table falls and the groundwater flows through the area primarily below the smear zone. This annual cycle explains the cyclic nature of the benzene concentrations downgradient at MW06.

The results of the Phase 3 Investigation indicated that the major concentration of the organic source material exists in a three- to six-foot thick interval between 633 and 627 feet above mean sea level (amsl)[1]. Historically, the groundwater elevations in this area have ranged between 633 and 629 feet amsl.

The soil samples collected from this smear zone yielded elevated concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX) as well as gasoline range and diesel range organics (GROs and DROs). The highest concentrations were detected in samples collected along the west side of Colfax Avenue, where the total BETX concentrations were as high as 1,039,000 micrograms per kilogram (µg/kg), and concentrations of GRO and DRO were as high as 920,000 µg/kg and 1,500,000 µg/kg, respectively.

The smear zone extends about 80 feet eastward from the barrier wall across Colfax Avenue, and about 200 feet northward from Reder Road to just north of borings SDPT-03 and SDPT-08 (Figure 2). The total volume of this smear zone calculated from these measurements is approximately 96,000 cubic feet. Further refinement of the extent of this zone is needed and these activities are included as part of this Work Plan.

[1] The Phase 3 Investigation Report previously stated that the interval was between 634 and 628 feet amsl. Further evaluation of the soil boring logs has determined that this interval is more accurately located between 633 and 627 feet amsl. During the Phase 3 Investigation, the water table was as low as 628 feet amsl, so much of the smear zone was above the water table during the investigation.

Another objective of the Phase 3 Investigation was to determine if ORC would be a cost effective method to treat the source of the groundwater plume. While the ORC was effective in reducing benzene concentrations in the plume on the short term, it did not appear to be sufficiently aggressive to destroy the residual organic compounds in the smear zone. Therefore, it was recommended in the Phase 3 Report to use the more chemically aggressive Chemical Oxidation (Chem-Ox) approach to treat the source area. Chem-Ox is an in-situ treatment process consisting of a blend of oxidizers and catalysts used in specific proportions to chemically convert organic contaminants into non-hazardous byproducts.

MWH proposes using a modified Fenton's Reagent, developed by In-situ Oxidative Technologies, Inc. (ISOTEC) of West Windsor, New Jersey, as the chemical oxidizer for treating the smear zone in the South Area. Fenton's Reagent typically consists of a mixture of hydrogen peroxide (i.e., the oxidizer) and ferrous iron (i.e., the catalyst). The oxidizer is injected into or around areas of known contamination in the subsurface. The catalyst converts the oxidizer into hydroxyl radicals, which in turn break down contaminants into harmless byproducts, such as carbon dioxide and water. Fenton's Reagent has been demonstrated to be an effective treatment for petroleum hydrocarbon contaminants, such as those found in the South Area.

While Fenton's Reagent is effective in treating organic contaminants, there can be some limitations in its use in the subsurface environment. First, the reaction is not controllable and is often short-lived because the catalyst is quickly spent. This allows the peroxide to autodecompose to water, oxygen, and heat upon contact with soil surfaces, reducing its effectiveness if the reagent is not put into contact with the contaminants in a short timeframe.

Secondly, typical Fenton's Reagent treatment requires a lowering of the pH of the treatment zone. Third, raw Fenton's Reagent has limited mobility in the subsurface and so there can be excess temperature and pressure buildups because the hydroxyl radicals will accumulate in the area immediateiy surrounding the injection point. When an accumulation of these radicals reacts with organic contaminants and natural organic matter, the heat and gases (such as $CO_2$) formed as a byproduct of the reaction build up. The combined effect of these limitations is that it is a challenge to get the reagent into contact with the organic contaminants while the reagent is still active.

ISOTEC has developed a modified Fenton's Reagent to overcome these challenges. ISOTEC adds proprietary catalysts, chelating agents, viscosity enhancers, and mobility control agents to the Reagent. These additional components help control reaction time and allow the oxidizer/catalyst mixture to be distributed further into the targeted area. ISOTEC's proprietary catalysts are designed to function under neutral pH values, eliminating the need for pH adjustment. Chelating agents prevent the catalyst from precipitating out of solution. The viscosity enhancers and mobility control agents are designed to increase the longevity of hydrogen peroxide in the subsurface and control the formation and distribution of the hydroxyl radicals. The oxidation process creates only a mildly exothermic reaction, which results in a small temperature rise, usually on the order of 5 to 10 degrees Celsius (°C).

The process can be used on a variety of soil types and grain sizes, including silts and clays. It has been used successfully in remediating sites contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs).

MWH has developed a phased approach for using modified Fenton's Reagent to treat the smear zone in the South Area. This phased approach will optimize delivery of the reagent for the specific physical conditions in the smear zone in the South Area. Various sampling and analysis activities will be conducted between these steps so that the subsequent steps can be focused and designed to be more efficient and cost effective. The South Area Chem-Ox Treatment program has been designed to consist of the following steps:

1. Treatability Study,
   a. Bench Study (Includes additional delineation of extent of smear zone)
   b. Field-Scale Application Study
2. Initial Full-Scale Application, and
3. Additional Full-Scale Application(s).

Although termed a *Treatability Study*, the effect will be a major step toward remediation of the residual organic material in the South Area smear zone. The Phase 3 investigation showed that the volume of soil containing residual organic material is approximately 96,000 cubic feet. The Treatability Study covered by this work plan will be treating more than 50,000 cubic feet, or approximately one-half of the known smear zone.

The Treatability Study will include baseline and post-application sampling to evaluate the effectiveness of the Chem-Ox Treatment. A component of the Treatability Study will be to further refine the extent of the smear zone, both horizontally and vertically. Evaluation of the Treatability Study data will be used to design an effective and efficient Full-Scale Application. The Full-Scale Application will be followed by more sampling to evaluate the effectiveness of the application, and the findings will be used to determine if additional full-scale or focused applications are necessary to eliminate the smear zone as a source of the groundwater plume south of the Site.

# 2.0 CHEMICAL OXIDATION TREATABILITY STUDY

The Treatability Study includes a Bench Study and a Field-Scale Application Study. Baseline and post-application sampling will be conducted to collect data on the performance of the Field-Scale Chem-Ox application and to refine the delineation of the smear zone source area.

## 2.1 BENCH STUDY

For the Bench Study, samples of soil and groundwater will be collected from the source area and laboratory analyzed. The objectives will be to determine the optimum concentrations and mixtures of Fenton's Reagent and ISOTECs additives to treat the site-specific organic compounds as they exist within the South Area smear zone. The objectives for the samples to be collected during the Bench Study include:

- To collect samples of soil and groundwater representative of the smear zone to use in a bench-scale laboratory study,
- To collect data on the baseline conditions for the Treatability Study area, and
- To further define the extent of the treatment area.

Fourteen locations will be sampled during the Bench Study. Proposed locations are shown in Figure 2. These locations will be confirmed and finalized during a kick-off meeting among MWH, United States Environmental Protection Agency (U.S. EPA), and Indiana Department of Environmental Management (IDEM) staff prior to starting the sample collection. Two soil borings (each marked with a circled dot) will be completed near previously completed borings SDPT-03 and SDPT-08, where oily material was observed within the smear zone. One soil and groundwater sample will be composited from the most severely impacted intervals in these borings and submitted for bench-scale testing.

The remaining twelve locations (triangles in Figure 2) will be sampled to collect soil and groundwater data to represent baseline conditions and to further define the extent of the treatment area:

- Two samples will be collected north of the proposed treatment area to determine the northward extent of the smear zone,
- Two samples will be collected east of the proposed treatment area to determine the eastward extent of the smear zone,
- Eight samples will be collected within the proposed treatment area to provide baseline conditions prior to the Treatability Study. Two of these samples will be collected approximately five and ten feet from a planned application point at the north end of

the proposed treatment area on the west side of Colfax Avenue. These will document the radius of influence achieved during the Treatability Study.

### 2.1.1 Soil Sampling Procedures

One soil sample will be collected from the most impacted interval within the smear zone at each of the sample locations, as determined by PID and visual observations. All soil sampling will be completed using DPT methods. The specific procedures will follow those approved in the "*Work Plan for Phase 3 Investigation*" (Phase 3 Work Plan; MWH, November 2002). These procedures are reproduced below.

The DPT rig will collect soil samples in four-foot long acetate sleeves from 16 to 24 feet below ground surface (bgs) (approximately 635 to 627 feet amsl). Upon retrieval, each sleeve will be cut open exposing a four-foot section of the aquifer matrix. The soil will be screened using a photo-ionization detector (PID). A sample from the section of the smear zone yielding the highest PID readings and/or visible evidence of contamination will be collected for laboratory analysis. After the samples for laboratory analysis have been collected, the soil cores from each sampling location will be classified using the Unified Soil Classification System (USCS).

### 2.1.2 Groundwater Sampling Procedures

One groundwater sample will be collected from the water table interface at each of the sample locations. Each groundwater sample will be collected by DPT methods following the low-flow sampling protocols approved in the Phase 3 Work Plan. The groundwater sampling SOP from the LTGMP is attached in Appendix A, and the DPT groundwater sampling procedure is reproduced below.

The DPT groundwater samples will be collected within the same DPT borehole where the soil samples where collected. Once the soil sampling activities have been completed, the DPT rig will push down within the same borehole to the upper portion of the saturated zone in the upper aquifer (between 18 and 20 feet bgs, depending on the water table). The first DPT rod will contain a two to three foot long stainless steel screen. After insertion to the appropriate depth, the DPT rods will be pulled back to expose the screen to the saturated zone.

Low-flow groundwater sample collection will be conducted using a peristaltic pump and disposable tubing. The inlet of the tubing will be set within the screened section of DPT rods. Groundwater will be purged and parameters recorded until they stabilize, as defined in the LTGMP SOP (Appendix A). Upon stabilization, the sample will be collected at each location.

### 2.1.3 Laboratory Analysis

One soil sample and one groundwater sample will be collected for the bench-scale laboratory study and sent to ISOTEC for their reagent mixture testing. These samples will be collected first to expedite ISOTEC's Bench-Scale Study. MWH will collect split-samples from the samples being sent to ISOTEC and analyze them for VOCs, GRO, and DRO for comparative purposes. The analytical protocols for the Bench-Scale Laboratory Study samples are

summarized in Table 1. ISOTEC will split the soil and water samples into several aliquots and will treat the samples with varying volumes of chemical oxidant and catalyst in order to determine the oxidant/catalyst mixture that is optimal for the site. Contaminant concentrations in treated samples and untreated control samples will be compared to initial contaminant concentrations to determine the effectiveness of the different oxidant/catalyst mixtures tested. Upon completion of the testing, ISOTEC will provide a report detailing the results and the recommended mixture for the Field-Scale Application Study. If the results determine that ISOTEC's oxidant/catalyst mixture is not suitable for use at the site, then the use of this technology will be re-evaluated.

The soil and groundwater samples collected for baseline and delineation purposes, as well as the split samples, will be sent to CompuChem Laboratories. The analytical protocols for these samples are summarized in Table 1. The baseline and delineation soil samples will be analyzed for VOCs, GRO, DRO, and total organic carbon (TOC). The baseline and delineation groundwater samples will be analyzed for VOCs, GRO, DRO, TOC, total dissolved solids (TDS), total and dissolved metals, sulfate, and pH.

## 2.2 FIELD-SCALE APPLICATION STUDY

The second part of the Treatability study is the Field-Scale Application Study. The Chem-Ox application activities will take approximately one week to complete in the field. The objectives include:

- Documenting the performance of the modified Fenton's Reagent mixture that was developed from the Bench Study,

- Evaluating the application design, including point spacing, volume, and depth interval, and

- If necessary, collecting additional samples to further characterize the nature and extent of the smear zone. (If data gaps are identified from the delineation sampling completed during the Bench Study, additional sampling would be proposed at this time).

ISOTEC estimates that 40 application points can be completed in one week. The Field-Scale Application Study was designed to apply these 40 points to the most impacted areas observed during the Phase 3 Investigation. This resulted in splitting the application into 2 arrays, half on the west side of Colfax Avenue and the other half on the other side of the street.. The 40 application points are shown within the shaded area on Figure 3.

ISOTEC has estimated a radius of influence between 7 and 10 feet under current site conditions, and therefore the application points have been located on a fifteen-foot spacing interval to allow for some overlap. Preliminary application locations are marked with small

filled circles on Figure 3. These locations may be altered based on field conditions or from the results of the Bench Study and the exact locations will be field marked during a kick-off meeting among MWH and the Agencies.

The smear zone was encountered at elevations between 633 and 627 feet amsl. While the observed thickness at specific points ranged from six feet at SDPT-03 to less than a foot at SDPT-02, the smear zone was always encountered between 633 and 627 feet amsl. Thus, the reagent will be applied over this six-foot interval throughout the study area.

The average water table in this area is 631 feet amsl, and annual ranges are typically 633 ft amsl in the spring and 629 feet amsl in late fall. Depending on water table elevations at the time of application, this may require treatment of up to two feet of unsaturated material. If the water table is below 631 (more than two feet below the top of the smear zone) then the application will be rescheduled.

The modified Fenton's Reagent will be applied to the subsurface through a slotted DPT screen, or equivalent, attached to the bottom of the DPT rods. This will maximize the horizontal distribution of the reagent. The reagent will be introduced to the subsurface under gravity-fed conditions or at low pressures (10-15 pounds per square inch (psi)). This typically results in the injection of between 200 and 400 gallons of reagent per application point. The reagent will be applied starting at the bottom of the application interval, working upwards until the entire application interval is covered.

### 2.2.1 Sampling Procedures

Four weeks after the application is completed, soil and groundwater samples will be collected from the eight baseline sampling locations within the Field-Scale Application Study area. These are the eight triangles within the hatched area in Figure 2.

The eight sample locations will be located within a few feet of the eight Bench Study baseline sample locations and will target the same depth interval. The soil and groundwater samples will be collected using the same methods as in the Bench Study (see Section 2.1.1 and 2.1.2 of this Work Plan).

### 2.2.2 Laboratory Analysis

The analyses planned for the post-application samples are summarized in Table 1. The soil samples will be analyzed for VOCs, DRO, GRO, and TOC. The groundwater samples will be analyzed for VOCs, DRO, GRO, TOC, TDS, total and dissolved metals, sulfate, and pH.

## 2.3 EVALUATION AND REPORTING

Data tabulations from the Bench Study will be provided to the Agencies as attachments to the Monthly Status Report issued after MWH has obtained the laboratory results. These results will be discussed at a bi-weekly construction meeting and used to refine the Field-Scale Application Study approach.

ISOTEC's Chem-Ox process involves oxidants reacting with organic material on the solid surfaces, such as soil particles, as well as with organic material in solution. These oxidants are non-specific in that they will react with organic contaminants just as readily as they will with native soil organic matter. However, in soil, organic contaminants may be bound onto soil particles by soil organic matter. Often in the Chem-Ox process the initial application can result in the breakdown of soil organic matter and the release of organic contaminants into solution, causing this initial increase in dissolved phase organic contaminant concentrations.

The evaluation of the Field-Scale Application data will document the effects of the treatment and look for any changes in concentrations in the immediate treatment area. While ISOTEC uses the Bench Study results to estimate the amount of desorption that may occur and the amount and strength of their reagents to inject to counter this desorption, there is still the possibility for an initial increase in concentrations. In addition, some of the application volume will be injected above the water table, and the flushing action of this fluid may result in initial increases in contaminant concentrations as well. All of these factors will be included in the evaluation of the technology.

A formal report will be prepared and submitted to the Agencies summarizing the findings from the Treatability Study. The report will include a description of activities, interpretation of results, tables, figures, and appendices as required. The report will also present a recommendation for the next step in the treatment; this may include a follow-up Field-Scale Application or plans for the Full-Scale Application.

## 2.4 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance/Quality Control (QA/QC) procedures will be performed in general accordance with the U.S. EPA-approved Quality Assurance Project Plan (QAPP; MWH, 2001) and Attachment 1 of the Phase 3 Work Plan (Laboratory SOPs and QC procedures for VOC analysis in soil). The analyses of the soil and groundwater samples will be completed by ISOTEC's laboratory and CompuChem Laboratories. Sample handling and chain-of-custody procedures will be conducted in accordance with the procedures outlined in the QAPP to ensure that sample integrity is maintained.

A modified list of Quality Control (QC) samples will be prepared for all VOC analyses of soil and groundwater samples. For this Treatability Study, QC samples will include one trip blank, one duplicate sample, and one matrix spike/matrix spike duplicate (MS/MSD) for soil and groundwater samples per sampling event. QC samples will not be collected for other evaluation parameters. The QC samples are summarized in Table 1. QC samples are not required for samples sent to ISOTEC.

Laboratory analysis and data validation procedures for VOC analyses will follow the QAPP procedures and protocols. All other laboratory analyses (GRO, DRO, TOC, etc.) will be checked in accordance with the laboratory's general QA/QC procedures.

## 2.5 SAFETY PROTOCOLS

A Task-Specific Safety Plan, provided in Appendix B, covers the safety issues anticipated for the planned activities, including drilling, sampling, and traffic coordination. This plan is an addendum to the health and safety procedures outlined in the Predesign Site Safety Plan (SSP) dated January 1996. ISOTEC's health and safety plan, which covers the specific health and safety issues associated with the Chem-Ox materials and injection safety hazards, is attached as an appendix to the Task-Specific Safety Plan. A copy will also be maintained at the ACS Remediation Site Office.

The main health and safety concerns include working near traffic, cold exposure, chemical exposure, and specific drilling hazards. In general, all work will be completed in modified Level D personal protective equipment (PPE). During drilling and sampling activities, air monitoring will be performed by MWH approximately every 15 minutes using a photo-ionization detector (PID) to measure for the presence of VOCs. Further details for air monitoring is outlined in the Task-Specific Safety Plan. Due to the potential for high concentrations of VOCs, specifically benzene, all workers must have the ability to upgrade to Level C PPE if needed.

For this Treatability Study, no application of Chem-Ox will be made within the Colfax Avenue roadway. However, it is expected that during the Full-Scale Application, after the radius-of-influence is determined, it may be necessary to conduct Chem-Ox applications through the roadway asphalt. In this case, arrangements will be made with the Town of Griffith to control and manage traffic along Colfax Avenue.

## 2.6 SCHEDULE

The proposed treatment schedule is included in Table 2. The objective is to complete the Treatability Study so that full-scale application could begin in late Spring or early summer. It is MWH's experience that a third or fourth Chem-Ox Application may be necessary. Usually each additional applications is smaller then the previous, focusing on recalcitrant zones in the source area. The purpose of this Work Plan is to layout the specifics of the Treatability Study and provide the framework for completing the source area remedy by additional applications.

## 3.0 REFERENCES


Montgomery Watson, January 1996. *Pre-Design Site Safety Plan.*

MWH, November 2001. *Quality Assurance Project Plan.*

MWH, September 2002. *Revised Long-Term Groundwater Monitoring Plan.*

MWH, November 2002. *Work Plan for Phase 3 Investigation.*

MWH, February 2004. *Phase 3 Investigation Report, South Area ORC Pilot Study. (Submitted to U.S. EPA and IDEM in September 2003. Not yet final).*


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# Tables

MWH

# Table 1
## Laboratory Analytical Summary
## Chemical Oxidation Work Plan
## American Chemical Service NPL Site, Griffith, Indiana

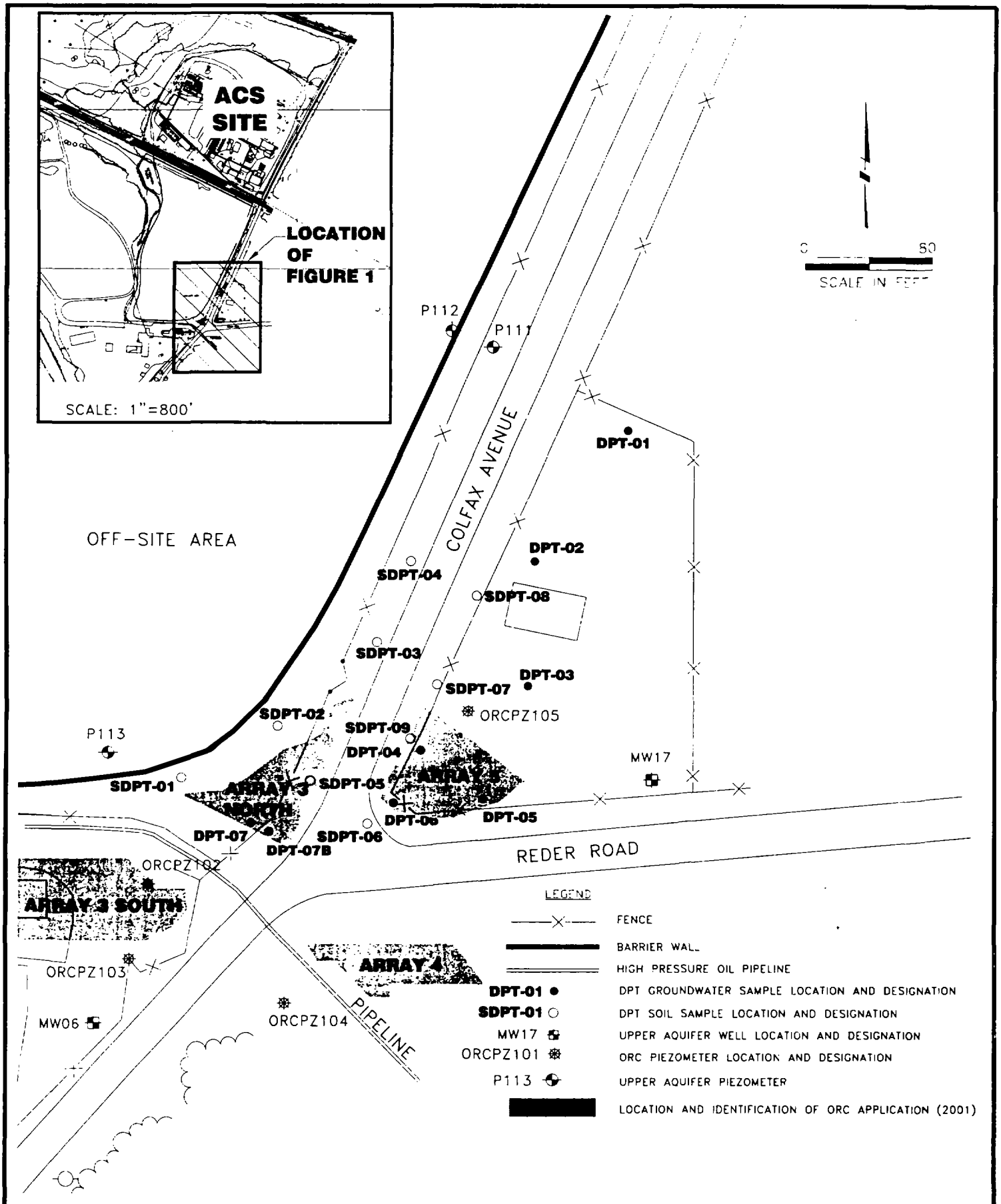
| Laboratory Analysis | Soil | | | | | | Groundwater | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ISOTEC's Reagent Test | VOCs | Quality Control | GRO/ DRO | TOC | pH | ISOTEC's Reagent Test | VOCs | Quality Control | GRO/ DRO | TOC | TDS | Sulfate | Total Metals | Dissolved Metals | pH |
| Method | ISOTEC | SW8260B | VOCs only | SW8015B | EPA 415.1 | SW9045C | ISOTEC | SW8260B | VOCs only | SW8015B | EPA 415.1 | EPA 160.1 | EPA 300 | SW6010B | SW6010B | Probe |
| **Bench Study** | | | | | | | | | | | | | | | | |
| Bench-Scale Laboratory Study | 1 | 1 | | 1 | | | 1 | 1 | | 1 | | | | | | |
| Delineation Sampling | | 4 | | 4 | 4 | 4 | | 4 | | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Baseline Sampling | | 8 | 4 | 8 | 8 | 8 | | 8 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| **Field-Scale Application Study** | | | | | | | | | | | | | | | | |
| Post-Application Sampling | | 8 | 4 | 8 | 8 | 8 | | 8 | 4 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

Notes
VOCs - Volatile Organic Compounds
GRO/DRO - Gasoline and Diesel Range Organics
TOC - Total Organic Carbon
TDS - Total Dissolved Solids
ISOTEC's soil sample requires approximately 10 pounds of soil
ISOTEC's groundwater sample requires 5 Liters and 2 40-ml vials
The groundwater sample for Total Metals will be unfiltered; the groundwater sample for Dissolved Metals will be field-filtered
Soil samples analyzed for VOCs will be preserved using 5035 Methods
For both soil and groundwater analyses, Quality Control samples will include a duplicate, trip blank, matrix spike, and matrix spike duplicate for each sampling event.

**Table 2**
**Schedule of Activities**
**Chemical Oxidation Work Plan**
**American Chemical Service NPL Site, Griffith, Indiana**

| Treatability Study Activity | Week Number | Anticipated Date |
|---|---|---|
| Agency Approval of Work Plan | 0 | March 5, 2004 |
| Bench Study Field Work | 1 | March 8-12, 2004 |
| Bench Study Analysis | 2-4 | March 9-April 2, 2004 |
| Bench Study Report due from ISOTEC | 5 | April 5, 2004 |
| Preparation for Field-Scale Application Study | 5-6 | April 6-16, 2004 |
| Field-Scale Application | 8 | April 26-29, 2004 |
| Four-Week Post-Application Sampling Event | 12 | May 24-28, 2004 |

# Figures




| MWH | AMERICAN CHEMICAL SERVICE NPL SITE GRIFFITH, INDIANA | SOUTH AREA LOCATION MAP | FIGURE 1 |
|---|---|---|---|

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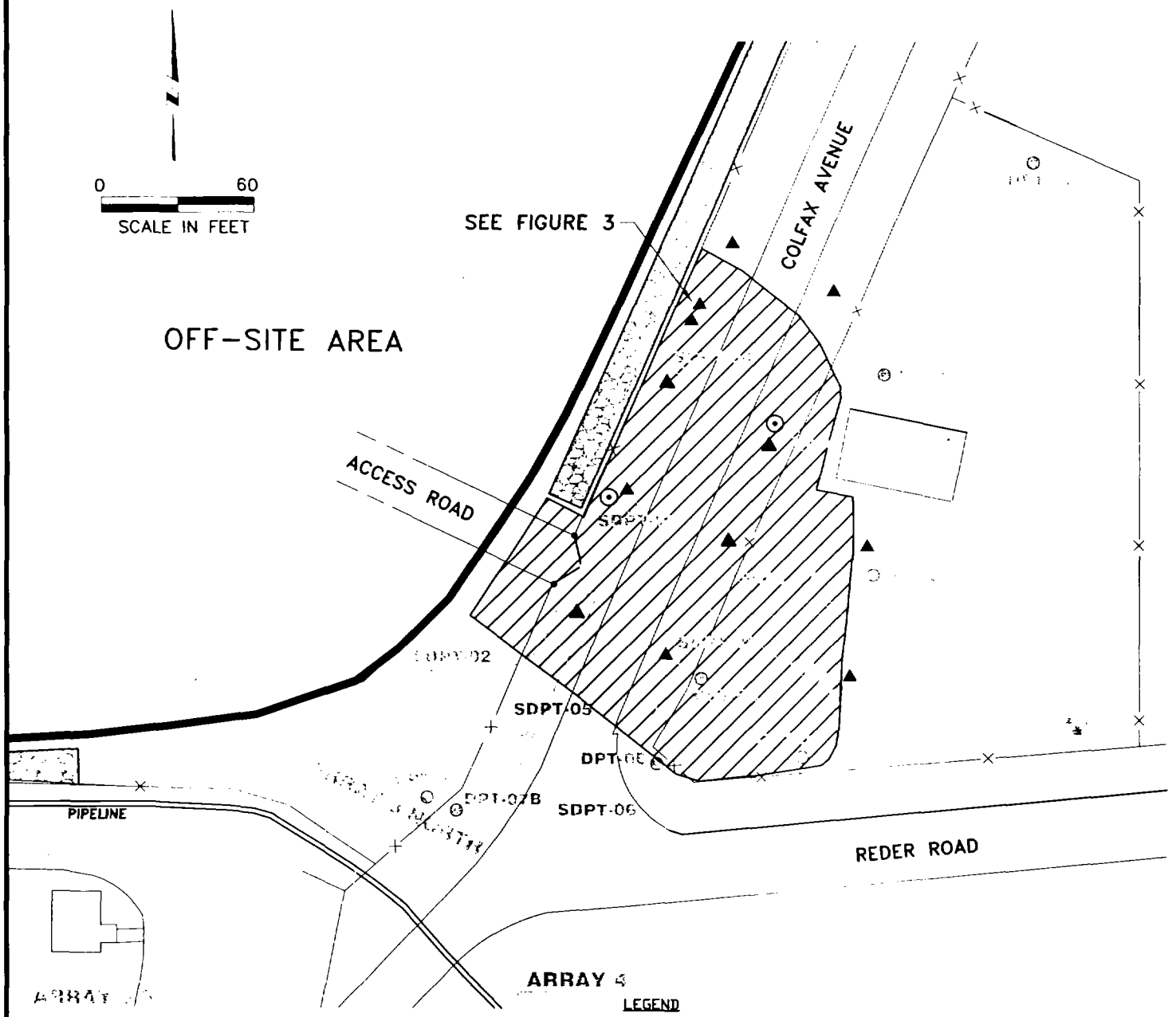


| MWH | AMERICAN CHEMICAL SERVICE NPL SITE GRIFFITH, INDIANA | PROPOSED SAMPLING LOCATIONS | FIGURE 2 |
|---|---|---|---|

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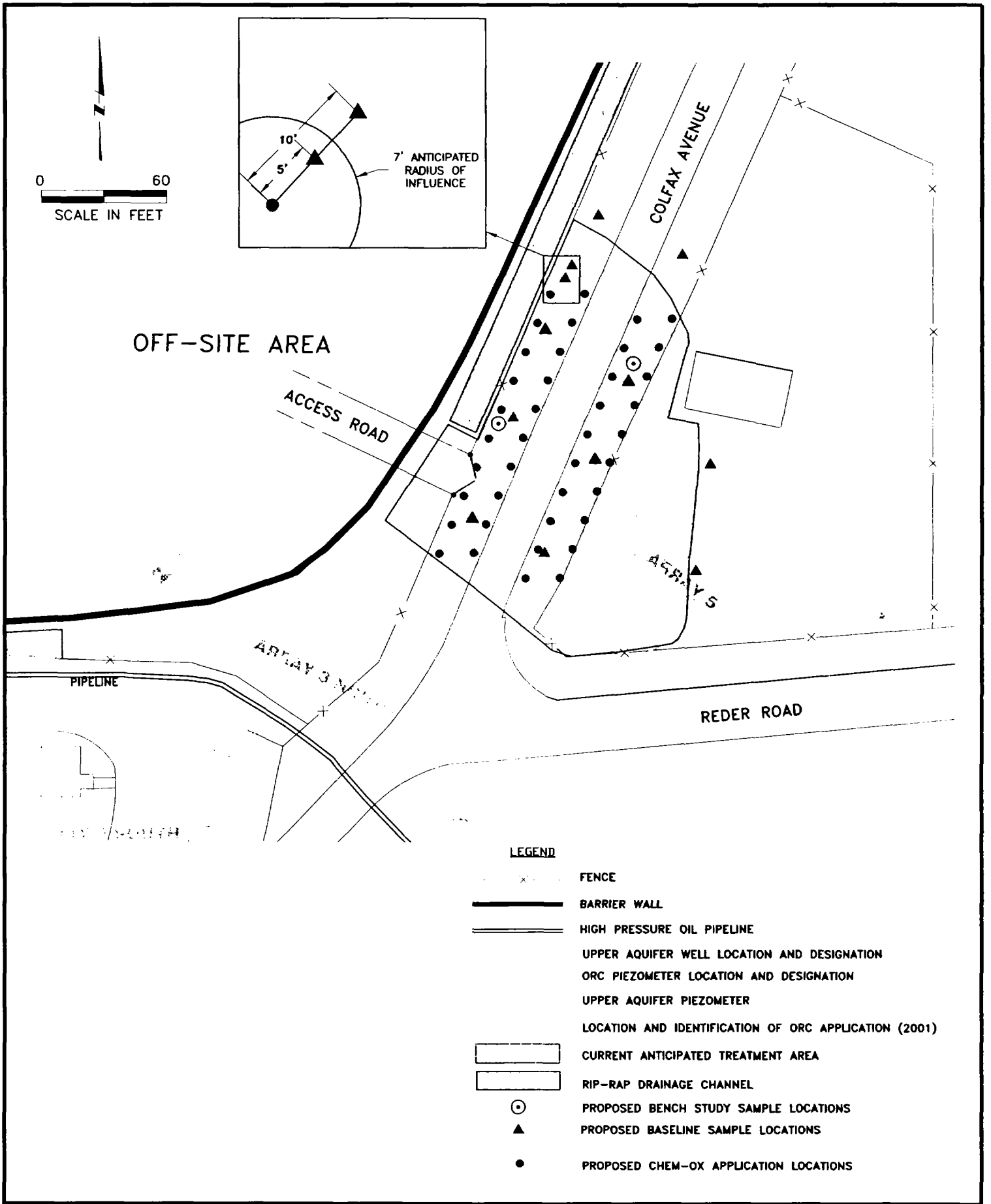


| MWH | AMERICAN CHEMICAL SERVICE NPL SITE GRIFFITH, INDIANA | FIELD APPLICATION STUDY LOCATION | FIGURE 3 |
|---|---|---|---|

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# APPENDIX A

## Specific Operating Procedures

# SPECIFIC OPERATING PROCEDURE
## AMERICAN CHEMICAL SERVICE NPL SITE
## GRIFFITH, INDIANA

### GROUNDWATER SAMPLING

Developed: April 18, 2001 Approved: June 26, 2002

---

**Scope:** This procedure is applicable for groundwater sample collection from monitoring wells (upper and lower aquifer) and residential wells at the ACS NPL Site. All sampling procedures will follow U.S. EPA *Low-Flow Groundwater Sampling Procedures* (EPA/540/S-95/504). The residential wells will be sampled using a slightly modified approach, but samples will be collected under low-flow conditions.

**Method:** Low Flow Sampling

## I. FIELD CHECKLIST

A. Paperwork to take to the site

1. Completed monitoring well construction summary for the wells to be sampled
2. Field Notebook
3. Health and Safety Plan
4. Chain of custody forms

B. Equipment to take to the site

1. Watch, or timing device
2. Electronic water level indicator
3. 5-gallon buckets
4. Plan for disposal of water
5. Decon solutions and buckets
6. Flow Cell
7. Pump and association equipment
8. Hand tools (socket set, hammer)
9. Sample bottles
10. Sample labels and tags
11. Well access (key)
12. Cooler(s) with ice
13. Packing Material (vermiculite, tape)

## II. LOW FLOW SAMPLING AT MONITORING WELLS

A. Measure and record depth to water from top of the well casing with electronic water level indicator. Examine the water level indicator for evidence of sheen, oily surface or other immiscible fluids and record this information in the field log book. Do not measure the total depth, as this will disturb any sediment that may have accumulated in the bottom of the well. If needed, the total depth measurement can be collected after the completion of sampling.

B. Refer to monitoring well construction summary for depth to top of the well screen. Set the intake point of the pump or tubing at the center or slightly above the center of the screen, preferably without letting the pump hit the bottom of the well.

C. While attaching the pump to the tubing, inspect the tubing for signs of deterioration, such as cracks, kinks, and holes. If sever kinks and holes exist, replace the tubing. New tubing will always be used to replace the old tubing (as opposed to previously used tubing that has been decontaminated). Prior to use, new tubing will be decontaminated (inside and out) using an Alconox solution and de-ionized water rinse.

D. Begin purging the well at a rate between 0.1 and 0.5 liters per minute (L/min). Confirm the purge rate by measuring the amount of water purged in one minute with a graduated measuring device, such as a 40 ml VOA sample container ***(If a 40-ml vial is used, assure that this vial will not be used for sampling by throwing the cap away and clearly labeling the vial "NOT FOR SAMPLING").*** Record this information in the field log book. Observe the purge water for evidence of a sheen, oily surface, or other immiscible fluids and record this information in the field log book. The pumping rates and respective duration to fill a 40-ml vial are as follows:

- 0.1 L/min = 24 seconds
- 0.2 L/min = 12 seconds
- 0.3 L/min = 8 seconds
- 0.4 L/min = 6 seconds
- 0.5 L/min = 5 seconds

E. While purging, field parameter measurements for pH, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature, and turbidity will be collected in line using the flow cell. Record these measurements in the field book at an interval between 3 and 5 minutes. At slower purging rates (0.1 L/min, longer intervals (5 min) between readings should be used.

F. Measure and record the depth to water from the top of casing periodically to determine if drawdown is occurring during purging. Drawdown of less than 1 foot in upper aquifer wells, and 2 feet in lower aquifer wells, is desirable. If drawdown is greater than these amounts, lower pump rates until the water level stabilizes, and record in field book.

G. If the water column in a well is less than three feet, then the well will be labeled "dry" and will not be sampled. A water column of at least three feet is required to collect a representative and accurate groundwater sample. The intake of the Grundfos sampling pump is at the top of the pump. During operation, the Grundfos pump cools itself by contact with the surrounding water. Without the cooling effect of the water, the pump will overheat and fail to operate properly, and also cause the groundwater temperature to increase, which may alter the sample composition by driving off VOCs. Because drawdown of up to one foot is expected during sampling, at least two feet of water is required above the intake of the pump. Since the pump length is about 1 foot, the pump intake will be located at least one foot above the bottom of the well. These requirements are the basis for minimum three feet of water in a well.

If the water level does not stabilize during purging, and the well is pumped dry, then the purging activities will cease at this well. The well will then be immediately sampled once the water level has returned to its original level, or within 24 hours, whichever is sooner.

H. When the parameter readings have stabilized, sample bottles can then be filled. Stabilization is defined as three consecutive readings within:

± 10% for temperature
± 0.1 for pH
± 3% for conductivity
± 10% for DO
± 10% or <10 NTU for turbidity
± 10 mV for ORP

I. Disconnect the flow-through cell and collect the sample(s) from the tubing ***prior*** to the flow-through cell. See Section V of this SOP for sample collection order. Samples shall be placed in a cooler and iced immediately after collection.

J. Purge water will be contained in 5-gallon buckets with lids, so that the amount of water purged during sampling can be recorded in the field log book and safely transported. All purge water will be transported to the MWH treatment building, where it will be treated and discharged to the wetlands.

K. Upon completion of sampling, promptly remove the sampling pump from the well. Decontaminate the pump by inserting the pump into a container prepared with a potable water and Alconox solution, followed by a distilled water rinse. Water generated during decontamination will also be collected and transported to the MWH treatment building. Fresh decontamination and rinse water will be prepared every day.

## III. LOW FLOW SAMPLING AT RESIDENTIAL WELLS

A. Collection of groundwater samples from residential wells involves attaching a hose to an outside spigot and running the water through the flow cell at low-flow rates. No pumps are involved.

B. Begin purging the well at a rate between 0.1 and 0.5 L/min, if possible. Confirm the purge rate by measuring the amount of water purged in one minute with a graduated measuring device, such as a 40 ml VOA sample container ***(If a 40-ml vial is used, assure that this vial will not be used for sampling by throwing the cap away and clearly labeling the vial "Not for sampling").*** Record this information in the field log book. The pumping rates and respective duration to fill a 40-ml vial are as follows:

- 0.1 L/min = 24 seconds
- 0.2 L/min = 12 seconds
- 0.3 L/min = 8 seconds
- 0.4 L/min = 6 seconds
- 0.5 L/min = 5 seconds

C. While purging, field parameter measurements for pH, specific conductance, dissolved oxygen, oxidation-reduction potential, temperature, and turbidity will be collected in line using the flow cell. Record these measurements in the field book at an interval between 3 and 5 minutes. At slower purging rates (0.1 L/min, longer intervals (5 min) between readings should be used.

D. When the parameter readings have stabilized, sample bottles can then be filled. Stabilization is defined as three consecutive readings within:

± 10% for temperature
± 0.1 for pH
± 3% for conductivity
± 10% for DO
± 10% or <10 NTU for turbidity
± 10 mV for ORP

E. Disconnect the flow-through cell and collect the sample(s) from the tubing ***prior*** to the flow-through cell. See Section V of this SOP for sample collection order. Samples shall be placed in a cooler and iced immediately after collection.

F. Purge water will be contained in 5-gallon buckets so that the total volume of purge water can be recorded. Purge water from residential wells may be spilled onto the ground in an inconspicuous manner and away from the residence.

G. If the residential well sampling event coincides with the monitoring well sampling, the residential wells will be sampled prior to the monitoring wells to prevent cross-contamination of the samples.

## IV. SAMPLE LABELING AND TAGGING

A. Sample labels and tags are used in conjunction with chain-of-custody documents to ensure sample identification, preservation, and custody requirements are maintained. Each label and tag will be labeled with a sample identifier code as defined below.

A three letter designation will be used for identifying the sampling site. The project identifier will be "ACS", to signify the American Chemical Service, Inc. NPL site.

Each groundwater sample will be identified by a two letter code, "GW" to identify the sample as a groundwater sample from a monitoring well or residential well.

The sample type code will be followed by a 2-5 digit alpha-numeric code to indicate sample location. This code will correspond to the monitoring well number (i.e., MW34) or residential well (i.e., PW-D).

The final two digits will signify the sampling round number.

For example, a groundwater sample collected from monitoring well MW-35 during round 12 will have the following sample label: ACS-GW-MW35-12.

B. U.S. EPA Sample Tags are used to identify all samples collected under the U.S. EPA Contract Laboratory Program (CLP). Tags are affixed to each to the bottles using a loop around the neck of the bottle. The information on the sample tag is filled in completely, with the sample identifier code described above.

## V. SAMPLE COLLECTION AND PREPARATION

A. All sample containers received from the laboratory will meet the specifications and protocols of U.S. EPA guidance document EPA540/R-93/051/12-92. All containers will have the appropriate preservatives already added to the containers.

B. Volatile Organic Compounds

1. Remove the plastic cap and Teflon® coated septum. If vial and/or cap appear to be defective, discard and use a new vial.

2. Carefully fill the vial with water at continuous low flow conditions until a meniscus (mound of water) forms on the top. Make sure that the preservative

is not washed out of the vial during filling. A recommended method is to fill the vial to just below the surface. Then fill the cap and use it to form the meniscus, thus preventing any accidental washing out of the preservative.

3. Carefully replace the cap on the meniscus. This will force a small amount of water off the top. Check the vial for bubbles by inverting vial and gently tapping the side of the vial. Bubbles will rise to the top, if present. If bubbles are present, top off with a few drops of sample and replace the cap again. If bubbles persist for three attempts, discard vial and try again. Place samples into cooler with ice upon sample completion.

C. Inorganics. Complete metals sampling following collection of VOC sample while continuing to purge the well at low-flow rates. Fill required containers to the shoulder. Place sample cooler into cooler with ice.

D. Semi-volatiles and PCBs. For sampling of semi-volatile organic compounds and PCBs, the flow rate may be increased up to 1.0 L/min, as long as there is no drawdown in the well. This method will not change the intended benefit of low flow sampling for VOCs and metals and it will reduce the total time required to fill the necessary sample jars.

1. With the water level indicator in the well, increase the flow rate. Select the flow rate that does not cause any increase in drawdown in the well.

2. Fill required bottles to the shoulder for semi-volatile compounds and PCB/pesticide analysis.

3. Immediately place the bottles in a cooler with ice.

## VI. DOCUMENTATION

A. All sample collection activities will be documented in the field log book. The field log book will contain the following information:

1. Sampling location
2. Sample identification number
3. Date and time of collection
4. Depth to water
5. Purging rate and approximate volume purged
6. Field parameter measurements
7. Field observation (weather, odor, sheen, etc.)
8. Name of sampling personnel
9. Analyses requested

B. The Chain-of-Custody (COC) record will be used to document the samples taken and analyses requested. The COC record(s) initiated in the field will be signed, placed in a plastic "zip-lock" bag, and secured inside of the shipping container used for sample transport. Signed air bills will serve as evidence of custody transport between the field sampler and courier as well as the courier and laboratory. Copies of the COC record and the air bills will be retained and filed by the sampler prior to shipment. Information that field personnel will record on the COC record includes the following:

1. Project name
2. Sampling location
3. Printed name and signature of sampler
4. Date and time of collection
5. Sample designation (QA/QC, grab or composite)
6. Sample matrix
7. Number of containers
8. Analyses requested
9. Signature of individual involved with custody transfer, including date and time of transfer.

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# APPENDIX B

## Task-Specific Safety Plan Addendum

# TASK-SPECIFIC SAFETY PLAN ADDENDUM
# IN-SITU REMEDIATION VIA CHEMICAL OXIDATION
# SOUTH AREA NEAR COLFAX AVENUE AND REDER ROAD

**AMERICAN CHEMICAL SERVICE, INC.**
**NPL SITE**
**GRIFFITH, INDIANA**

**MWH File No.: 2090601**

**Prepared For:**

**ACS RD/RA Executive Committee**

**Prepared By:**

**MWH, Inc.**
**175 West Jackson Blvd.**
**Suite 1900**
**Chicago, Illinois 60604**

**February 2004**

# TASK-SPECIFIC SAFETY PLAN ADDENDUM
# IN-SITU REMEDIATION VIA CHEMICAL OXIDATION
# SOUTH AREA NEAR COLFAX AVENUE AND REDER ROAD

## AMERICAN CHEMICAL SERVICE, INC.
## NPL SITE
## GRIFFITH, INDIANA

**MWH File No.: 2090601**

**Prepared For:**

**ACS RD/RA Executive Committee**

**Prepared By:** _____ 5/21/04

Chad A. Smith, P.G.
Professional Hydrogeologist
Date

_____ 5/21/04

Scott Allen
Health and Safety Officer
Date

**Approved By:** _____ 5/21/04

Peter J. Vagt, Ph.D., CPG
Vice President
Date

## EMERGENCY INFORMATION

**Emergency Phone Numbers**
(Nearest phone inside MWH Treatment Building or MWH Work Trailer)

| | |
|---|---|
| Ambulance | 911 |
| Poison Control | (800) 222-1222 |
| Police | 911 |
| Fire | 911 |
| State Highway Patrol | (800) 552-8917 |
| IDEM Emergency Response | (888) 233-7745 |
| EPA Region 5 Spill Response | (312) 353-2318 |

**Nearest Phone, First Aid Kit, Fire Extinguisher, and Eye Wash Station** — MWH Treatment Building

**Nearest Hospital**

Munster Community Hospital
901 McArthur Boulevard
Munster, Indiana
(219) 836-1600
(219) 836-4511 (emergency room)

**Project Contacts**

MWH

| | | |
|---|---|---|
| Project Coordinator (PC) | Joseph Adams, Jr. | (303) 410-4040 |
| Project Manager | Peter Vagt | (312) 831-3466 |
| Site Safety Officer (SSO) | Lee Orosz | (219) 924-4607 |
| Health & Safety Officer (HSO) | Scott Allen | (312) 831-3820 |
| Health & Safety Manager (HSM) | Mike Schmoldt | (248) 767-8211 |

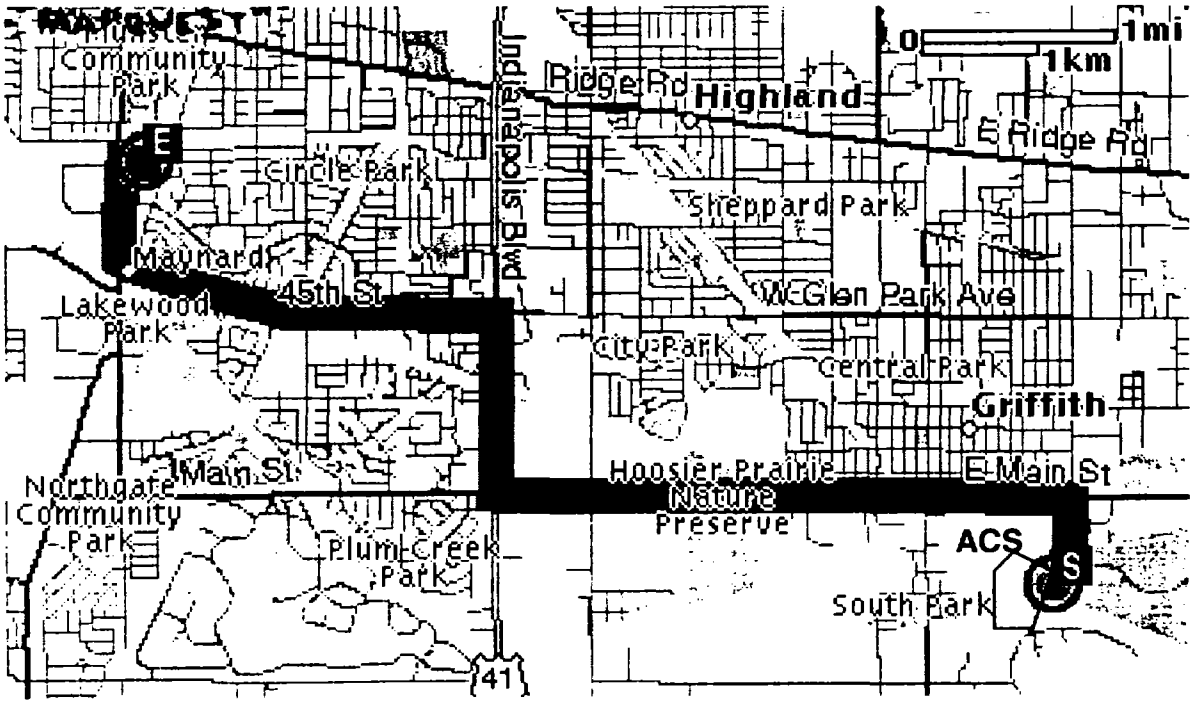
Regulatory Agencies

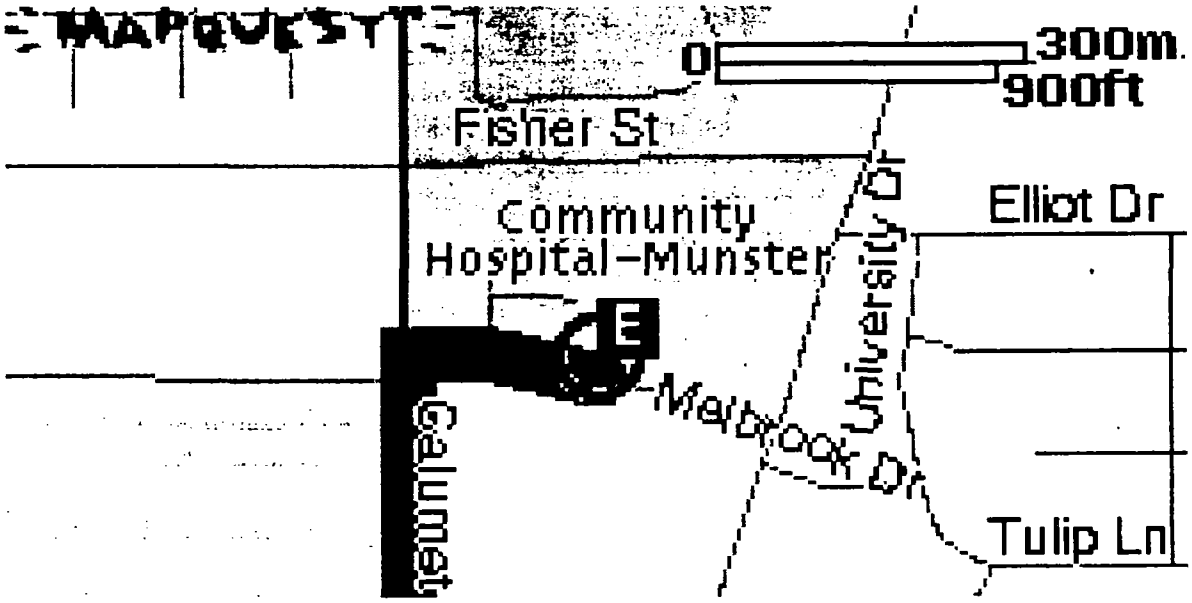
| | | |
|---|---|---|
| U.S. EPA Remedial Project Manager | Kevin Adler | (312) 886-7078 |
| IDEM Project Manager | Prahbhakar Kasarabada | (317) 308-3121 |

**Utilities**

| | | |
|---|---|---|
| Utility Locate | IUPPS | (800) 382-5544 |
| Telephone | Ameritech | (800) 636-1200 |
| Gas/Electric | NIPSCO | (800) 634-3524 |
| Water/Sewer | Griffith Public Works | (219) 924-3838 |

Directions to hospital: Exit ACS Site onto Colfax and go north to Main Street. Turn left onto Main Street and head west to Indianapolis Boulevard (Route 41). Turn right onto Route 41 and go north to 45th Street. Turn left onto 45th Street go west to Calumet Avenue. Turn right onto Calumet Avenue, and go north about 0.6 miles. Follow signs to the hospital emergency entrance, which is on the east side of street.



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## APPENDICES

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACS | American Chemical Service, Inc. |
| BETX | Benzene, Ethylbenzene, Toluene, Xylenes |
| Chem-Ox | Chemical Oxidation |
| CPR | Cardiopulmonary Resuscitation |
| dB | decibels |
| DPT | Direct-push technology |
| DRO | Diesel Range Organics |
| °F | Fahrenheit |
| FSP | Field Sampling Plan |
| GRO | Gasoline Range Organics |
| HSO | Health and Safety Officer |
| HSM | Health and Safety Manager |
| IDEM | Indiana Department of Environmental Management |
| IDW | Investigative-Derived Waste |
| IUPPS | Indiana Underground Plant Protection Service, Inc. |
| JHA | Job Hazard Analyses |
| LTGMP | Long-Term Groundwater Monitoring Plan |
| NIPSCO | Northern Indiana Public Service Company |
| NPL | National Priorities List |
| PC | Project Coordinator |
| PCB | polychlorinated biphenyl |
| PID | photo-ionization detector |
| PPE | personal protection equipment |
| ppm | parts per million |
| Predesign SSP | Predesign Site Investigation Site Safety Plan |
| psi | pounds per square inch |
| OSHA | Occupational Health and Safety Administration |
| RD/RA | Remedial Design/Remedial Action |
| SVOC | Semi-Volatile Organic Compound |
| SSO | Site Safety Officer |
| SSP | Site Safety Plan |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

# 1.0 INTRODUCTION

This Task-Specific Site Safety Plan Addendum (SSP Addendum) addresses health and safety procedures for all activities associated with the Chemical Oxidation (Chem-Ox) treatment conducted at the American Chemical Service, Inc. (ACS) National Priorities List (NPL) Site. The procedures established in this SSP will minimize potential risk to MWH personnel performing on-site work. This SSP Addendum should be used in conjunction with the Predesign Site Investigation SSP (Predesign SSP) dated January 1996.

The Predesign SSP and this SSP Addendum apply to all MWH employees who will potentially be exposed to safety or health hazards associated with the field activities related to the Work Plan for In-Situ Remediation via Chemical Oxidation (Work Plan). Subcontractors will be required to provide their own SSP, which at a minimum, must comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operation and Emergency Response Standards (29 CFR 1910.120) and other applicable OSHA regulations. The subcontractors' SSP must be approved by the MWH health and safety officer.

This SSP Addendum has been developed based on knowledge of the specific chemical hazards and potential physical hazards associated with the planned activities, which include direct-push technology (DPT) drilling, temporary monitoring well installation, soil and groundwater sampling, and subsurface application of Chem-Ox treatment. The activities will test the performance for using a modified Fenton's Reagent for in-situ treatment of organic contaminants in the South Area. This study involves conducting a bench scale laboratory study and a small-scale field application of an oxidizer, and collecting soil and groundwater samples from the treatment area to determine the treatment's effectiveness. This SSP addendum addresses the activities described in the Work Plan. If the study is successful, this SSP addendum will be updated and submitted with the application plan for the full-scale treatment.

The Predesign SSP and this SSP Addendum have been prepared in compliance with the requirements of the OSHA Hazardous Waste Operation and Emergency Response Standards (29 CFR 1910.120) and other applicable OSHA regulations. Actual working conditions may require modification of this SSP Addendum. Except for minor modifications or in emergency situations, the MWH Health and Safety Manager (HSM) or local Health and Safety Officer (HSO) must approve any modifications before they can be implemented. Written documentation of the change must be attached as additional addenda to this SSP Addendum.

# 2.0 SITE DESCRIPTION AND SCOPE OF WORK

## 2.1 SITE DESCRIPTION

The ACS Site is located at 420 South Colfax Avenue in Griffith, Indiana. The facility began as a solvent recovery facility in 1955, with some chemical manufacturing operations beginning in the late 1960's. Detailed site descriptions are provided in Section 2.0 of the Predesign SSP and various other reports.

While a wide range of contaminants has been detected inside the barrier wall, only a few volatile organic contaminants (VOCs), specifically benzene and chloroethane, have been identified as contaminants of concern in groundwater outside of the barrier wall. South of the Site, a plume of benzene and chloroethane impacted groundwater has been determined to extend several hundred feet to the south and southeast. Recent investigations immediately outside of the barrier wall in the South Area have identified an area of soil contamination near the water table that has likely been the source for this groundwater plume. The specific contaminants detected included benzene, ethylbenzene, toluene, and xylenes (BETX) and diesel and gasoline range organics (DROs and GROs). The Chem-Ox Work Plan has been developed to remediate this area of elevated concentrations and remove it as a source for the groundwater plume to the south.

## 2.2 SCOPE OF WORK

The activities scheduled for this Chem-Ox study in the South Area include the following:

- DPT drilling and collection of soil and groundwater samples;
- Installation of temporary monitoring wells; and
- Application of a chemical oxidizer to the subsurface.

All chemical handling and injection activities will be conducted by In-situ Oxidative Technologies, Inc. (ISOTEC), of West Windsor, New Jersey and a separate drilling subcontractor (PSA Environmental). The chemical oxidizer to be used is a modified Fenton's Reagent, which presents fewer health and safety hazards than regular Fenton's Reagents. Details and specific health hazards of the material and its application are provided in the ISOTEC Health and Safety Plan, a copy of which is provided in Appendix A. A copy of ISOTEC's Health and Safety Plan will also be kept at the ACS Remediation Site Office.

# 3.0 PROJECT-SPECIFIC HEALTH AND SAFETY PROCEDURES

## 3.1 KEY PERSONNEL AND RESPONSIBILITIES

Assignment of responsibilities for development, coordination and implementation of this SSP Addendum is essential for proper administration of the Plan's requirements. Implementation of the SSP Addendum will be accomplished through an integrated effort of the Project Coordinator (PC), Health and Safety Officer (HSO), and Site Safety Officer (SSO).

Project Coordinator – The PC is primarily responsible for safety performance of the project and is the central point of contact with the ACS Remedial Design/Remedial Action (RD/RA) Executive Committee. Should a health and safety issue develop in the performance of the field activities, the PC will contact the ACS RD/RA Executive Committee and the MWH HSO.

Health and Safety Officer – The HSO is responsible for preparation of the SSP Addendum. The HSO will ensure that the SSP Addendum complies with OSHA standards and site-specific health and safety requirements based on known or anticipated health and safety concerns. The HSO will be available for consultation when required. The HSO may visit the Site during field activities to perform a site safety audit.

Site Safety Officer – The SSO is responsible for the implementation of the SSP Addendum. The SSO has the responsibility and authority to halt or to modify any work condition or remove personnel from the Site if he or she considers conditions to be unsafe. The SSO will be the main contact in any Site emergency situation. The SSO will ensure that all MWH personnel understand and comply with site safety requirements. If necessary, the SSO can modify the SSP Addendum to accommodate changes that may affect safety with the approval of the HSO. In the event of an accident, injury or 'near-miss' incident, a verbal report or form describing the incident must be filled out by the SSO and reported (phone, fax or email) to the HSO. These reports should be submitted as soon as possible after the incident, as soon as it is safe to do so, or at least within 24 hours of the incident.

Field Staff – All MWH field staff are responsible for understanding and complying with all requirements of the Predesign SSP and this SSP Addendum. Each day before the start of field activities, a tailgate safety meeting will be conducted by the SSO or field team leader to instruct the field staff on the day's activities as well as this SSP Addendum's requirements. During this meeting, site safety questions can be directed to the meeting leader by the field staff. Each worker must sign and date a Tailgate Safety Meeting Form stating that he or she understands the contents of the Predesign SSP and this SSP Addendum. An example of a Tailgate Safety Meeting Form is attached in Appendix B.

## 3.2 SAFETY ISSUES OF CONCERN

Several activities outlined in the Work Plan have the potential to pose a severe hazard. In addition to the common hazards of subsurface drilling, many of the chemicals to be used are corrosive or are strong oxidizers. Application of the reagent will occur under no or very low pressures (10 to 15 pounds per square inch (psi)). The other main activities will include DPT drilling, installation of temporary monitoring wells, and soil and groundwater sampling. The safety issues related to these activities are outlined below.

### 3.2.1 Chemical

Based on groundwater data collected from the Chem-Ox study area, volatile organic compounds (VOCs) and other petroleum hydrocarbons are the main compounds of concern. No or insignificant amounts of halogenated hydrocarbons have been detected in this area. Semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and inorganics have not been detected in groundwater at significant amounts around the Site.

BETX compounds and other petroleum hydrocarbons, reported as DRO and GRO, have been detected at elevated amounts in groundwater and soil samples collected from the South Area. The BETX compounds are highly volatile, moderately soluble, biodegradable, and only slightly adsorbed on soils and sediments. They are very mobile in groundwater. Exposure to these substances is primarily through vapor inhalation, although absorption through skin may also readily occur. Acute exposure poses the primary health hazard of these substances. Low-level exposure may result in irritability, excitability, muscle tremor, and headache.

### 3.2.2 Physical

Automobile traffic along Colfax Road represents the primary physical hazard during the Chem-Ox application activities. Drilling and sampling activities will take place within 25 feet of Colfax Road, therefore workers must be cognizant of passing cars and trucks. Excessive noise generated by drill rigs may mask the sound of passing vehicles. Workers wearing earplugs to provide hearing protection from the drill rigs will have even greater difficulty hearing passing vehicles. Therefore, when drilling or injection activities are occurring within ten feet of the road, a spotter will be present to watch for traffic and ensure that work activity does not stray too close to the road. In addition, orange safety cones will be placed five feet away from the road in the work zone as a safety buffer. No work will be conducted within the safety buffer.

Other physical hazards at the ACS Site include common slip, trip, and fall hazards. Work Plan activities will be completed near Colfax Road where slip, trip, and fall hazards are prevalent in wet or damp conditions. Caution should be taken while walking through the work area to avoid tripping over any drill rig equipment that may be present.

### 3.2.3 Biological

General biological hazards at the ACS Site include insects, snakes, rodents, poisonous plants, and spider species. The most common biological hazards include mosquitoes, ticks,

and poison ivy. Special care should be taken to avoid these hazards and wear the appropriate clothing and repellant when necessary.

### 3.2.4 General

No eating, drinking, use of tobacco products, including smoking or chewing, or other hand-to-mouth activities will be permitted in the work areas during the course of this project. Eating, drinking, smoking and break areas are located just outside of the MWH Treatment Plant and Work Trailer. These areas will be appointed by the MWH SSO.

## 3.3 AIR MONITORING

Air monitoring will be conducted during subsurface drilling activities to monitor for VOC vapors. It is not expected that VOC vapors or explosive atmospheres will be encountered. The presence of VOCs will be monitored by a photo-ionization detector (PID) with a lamp rating of 10.4 eV. The exposure action limits for worker breathing zones are:

- **<1 ppm as measured in PID instrument units**. No action, continue work.

- **1 ppm (continuous) as measured in PID instrument units**. Collect a colorimetric tube (Draeger tube) sample to determine whether breathing zone air contains 1 ppm or more of benzene.

- **<1 ppm as measured by colorimetric tube AND < 200 ppm as measured in PID instrument units**. Continue monitoring and proceed with work.

- **>1 ppm benzene as indicated by colorimetric tube**. If colorometric tube indicates the presence of benzene >1 ppm, stop work and withdraw from area for 15 minutes. Retest after 15 minutes. If reading is still >1 ppm as benzene cover exposed media and slow work rate. Retest again after 15 minutes. If still >1 ppm stop work and contact the Regional Health and Safety Manager for additional guidance.

- **>200 ppm as measured in PID instrument units.** Stop work and withdraw from contaminated area for 15 minutes. Retest after 15 minutes. If still >200 ppm as measured in instrument units, cover exposed media and slow work rate. Retest again after 15 minutes. If still >200 ppm, stop work and contact the Health and Safety Officer for additional guidance.

Air monitoring will be performed by MWH personnel at the start of drilling activities and approximately every 15 minutes, or if odors are encountered in the soil cuttings. The monitoring results will be recorded in the field book or a log form. The PID meter will be calibrated at the beginning of each day, and will be performed per manufacturer's instruction.

## 3.4 PERSONAL PROTECTIVE EQUIPMENT

At a minimum, Level D PPE will be worn during Site activities. If air monitoring indicates that air respirators or other Level C PPE is needed for Work Plan activities, then the PPE procedures in the Predesign SSP will be followed, and a separate addendum will be prepared and submitted for approval. A description of Level D PPE follows below:

Level D – DPT drilling and temporary monitoring well installation

- Steel-toe boots
- Latex or Nitrile gloves
- Hard hat
- Safety glasses
- Traffic Safety Vests
- Hearing protection*(within 25 feet of drill rig)
- Vinyl or butyl rubber boot covers*
- Tyvek*

* Optional PPE: use as needed

## 3.5 EMERGENCY INFORMATION

Prior to work startup, the SSO or field team leader will discuss the emergency medical assistance network at the Site with all personnel assigned to the field project. Locations of phones, fire extinguishers, first-aid kits, emergency telephone numbers, etc. will be identified. Unless otherwise noted, phones, fire extinguishers, and first-aid kits are all located at the MWH treatment building.

Emergency information is provided below and in the quick-reference sheet at the beginning of this document.

Emergency Phone Numbers
(Nearest phone inside MWH Treatment Building or Work Trailer)

| | |
|---|---|
| Ambulance, Police, or Fire | 911 |
| Poison Control | (800) 222-1222 |
| State Highway Patrol | (800) 552-8917 |
| IDEM Emergency Response | (888) 233-7745 |
| EPA Region 5 - Spill Response | (312) 353-2318 |

| | |
|---|---|
| Nearest Phone, First Aid Kit, Fire Extinguisher, and Eye Wash Station | MWH Treatment Building |

Nearest Hospital

Munster Community Hospital
901 MacArthur Boulevard, Munster, Indiana
(219) 836-1600
(219) 836-4511 (emergency room)

Directions to hospital: Exit ACS Site onto Colfax and go north to Main Street. Turn left onto Main Street and head west to Indianapolis Boulevard (Route 41). Turn right onto Route 41 and go north to 45th Street. Turn left onto 45th Street go west to Calumet Avenue. Turn right onto Calumet Avenue, and go north about 0.6 miles. Follow signs to the hospital emergency entrance, which is on the east side of street.

Project Contacts

MWH

| | | |
|---|---|---|
| Project Coordinator | Joseph Adams, Jr. | (303) 410-4040 |
| Project Manager | Peter Vagt | (312) 831-3466 |
| Site Safety Officer (SSO) | Lee Orosz | (219) 924-4607 |
| Health & Safety Officer (HSO) | Scott Allen | (312) 831-3820 |
| Health & Safety Manager (HSM) | Mike Schmoldt | (248) 767-8211 |

Regulatory Agencies

| | | |
|---|---|---|
| U.S. EPA Remedial Project Manager | Kevin Adler | (312) 886-7078 |
| IDEM Project Manager | Prahbhakar Kasarabada | (317) 308-3121 |

Utilities

| | | |
|---|---|---|
| Utility Locate | IUPPS | (800) 382-5544 |
| Telephone | Ameritech | (800) 636-1200 |
| Gas/Electric | NIPSCO | (800) 634-3524 |
| Water/Sewer | Griffith Public Works | (219) 924-3838 |

## 3.6 JOB HAZARD ANALYSES

Appendix C contains Job Hazard Analyses (JHA) for the various tasks to be completed during this project. The JHAs summarize particular hazards that may be associated with the various activities outlined in this Work Plan.

## 3.7 DECONTAMINATION

### 3.7.1 Personal

All safety gloves will be disposed of in the appropriate container. If gloves or other clothing is grossly contaminated, it will be cleaned prior to disposal. All decontamination water will be collected and disposed of at the MWH Treatment Building. Prior to snack or lunch breaks, each person should thoroughly wash his or her hands and face in soap and water. At the end of each day, each person involved in Site activities should shower as soon as possible.

### 3.7.2 Equipment

In general, sampling and drilling equipment will be decontaminated between each borehole. Decontamination procedures will be conducted in accordance with Section 4.5 of the Field Sampling Plan (FSP; Appendix B of the Long-Term Groundwater Monitoring Plan (LTGMP), MWH, September 2002). In general, equipment will be cleaned in an alconox detergent wash and then rinsed with water. Drilling equipment will be decontaminated using a steam pressure wash. All decontamination water will be collected for treatment at the MWH Treatment Plant.

## 3.8 INVESTIGATIVE DERIVED WASTE

Anticipated Investigative Derived Wastes (IDWs) to be generated during the Work Plan's activities include liquids, solids, and general refuse. Liquid IDW includes groundwater collected during purging during groundwater sampling, and decontamination wash and rinse water. All liquid IDW will be collected and disposed of at the MWH treatment plant, where it will be treated and discharged to the wetlands. Solid IDW includes soil cuttings generated during DPT drilling and Chem-Ox injection activities. Since low amounts of solid IDW are anticipated, these wastes will be collected and placed in the hazardous roll-off box at the treatment plant. The materials in the roll-off box are transported off-site for proper disposal. General refuse IDW includes disposable sampling equipment and PPE, such as disposable nitrile gloves. This material will be placed in trash bags and disposed of as solid waste at a local landfill, as long as it is not grossly contaminated. Grossly contaminated refuse will be cleaned prior to disposal or placed with solid IDW.

# 4.0 GENERAL SITE HEALTH AND SAFETY CONSIDERATIONS

This section describes general health and safety concerns not associated with specific tasks to be accomplished at the Site.

## 4.1 WEATHER CONDITION RESTRICTIONS

Since weather conditions on Site cannot be controlled, Site personnel are to be aware of the warnings of impending severe weather and the precautions that are to be taken. Thunderstorms, tornadoes, and winter storms can develop quickly, and jeopardize the safety of Site personnel. Should severe weather threaten, the Site Safety Officer (SSO) has the authority to place site activities on standby, to cease operations, and evacuate the Site as deemed necessary. The following procedures are to be followed in the event of severe weather

**Thunderstorms and Lightning**

- Monitor weather conditions at all times. Check the weather forecast at the beginning of each day for the latest weather information.

- When a thunderstorm accompanied by lightning is in the project area, cease work immediately. All powered equipment, such as a drill rig, is to be shut down. Wait at least 15 minutes after the last lightning strike to continue work.

- Seek shelter inside nearby buildings or trailers. If there are no buildings nearby, stay inside a vehicle. If away from any form of shelter, do not stand beneath tall, isolated trees or telephone poles. Avoid hill tops, open water, metal equipment, wire fences and metal pipes.

- If you are caught in a level field or open area far from shelter, and you feel your hair stand on end, lightning may be about to strike you. Drop to your knees and bend forward, putting your hands on your knees. You should minimize the body area in direct contact with the ground, and avoid lying flay on the ground.

- If someone has been struck by lightning, monitor life signs. You may begin to perform cardiopulmonary resuscitation (CPR) as needed if you choose to. Send for help. Check conscious victims for burns, especially at the fingers and toes and next to knuckles and jewelry. You may perform first aid for shock if you choose to. Do not let the victim walk around.

**Tornadoes**

- Tornadoes usually develop from thunderstorms and normally occur at the trailing edge of the storm. Most tornadoes occur in the months of April, May, June, and July in the late afternoon and early evening hours.

- When storms are predicted for the project area, monitor weather conditions on a radio. A tornado watch is issued when favorable conditions exist for the development of a tornado, a tornado warning is issued by the local weather service office whenever a tornado has actually been sighted.

- If a tornado warning is issued, seek shelter immediately. If there are permanent buildings, go there immediately, moving towards interior hallways or the lowest floor. If no shelter is nearby, lie flat in a ditch or depression and hold onto something on the ground, such as a bush or fence post.

- Once a tornado has passed the Site, site personnel are to assemble at the MWH treatment building immediately to determine if anyone is missing. You may administer first aid and seek medical attention as needed.

**Winter Storms**

- When snow or ice storms are predicted for the project area, Site personnel should monitor weather conditions on a radio. A winter storm watch is issued when a storm has formed and is approaching the area, and a winter storm warning is issued when a storm is imminent and immediate action is to be taken.

- When a storm watch is issued, monitor weather conditions and prepare to halt site activities. Notify the project manager of the situation. Seek shelter at site building or leave the site and seek warm shelter.

- If caught in severe winter weather while traveling, seek warm shelter if road conditions prevent safe travel.

- If stranded in a vehicle during a winter storm, stay in the vehicle, wait for help, and keep a window open an inch or so to avoid carbon monoxide. Run the engine sparingly to keep warm, and try to exercise occasionally.

## 4.2 TEMPERATURE STRESS

Since hot or cold weather cannot be controlled, site personnel need to be aware of engineering controls that can reduce temperature stress, the signs and symptoms of temperature stress and first aid measures for victims of temperature stress. The procedures for monitoring temperature stress are as follows:

## Cold Stress

- In general, if extreme cold temperatures exist (<0 °F), the continuance of work should be evaluated. Groundwater sampling may not be feasible at temperatures far below freezing.

- Reduction of cold temperatures can be achieved by spot heating: shielding work areas from wind, and using heated rest areas (including vehicles).

- Cold stress can be reduced by drinking warm drinks or soups frequently, using heated rest areas frequently, using the buddy system, and taking extra breaks as needed. Do not pressure someone to work beyond his or her capabilities.

- Reorganize work procedures so as much of a job can be done in a warm environment as possible.

- Remove wet clothing if possible.

- Send a worker to warm shelter immediately if any of the following symptoms are noted: heavy shivering, frostnip (skin turns white), feeling of excessive fatigue, drowsiness, euphoria.

- First aid: Take victim to a warm area and remove the outer layers of clothing. Gently warm the affected area, submerge in tepid water if possible. Do not rub. If there is evidence of frostbite, obtain medical attention immediately.

## Heat Stress

- In general, if extreme hot temperatures exist (>100 °F), the continuance of work should be evaluated.

- Reduction of hot temperatures can be achieved by developing and adhering to a work-rest schedule and taking breaks in cool areas.

- Heat stress can be reduced by drinking cool fluids hourly, avoiding caffeine and alcohol, using the buddy system, and taking extra breaks as necessary. Do not pressure someone to work beyond his or her capabilities.

- Schedule work for the cooler parts of the day.

- If your heart rate exceeds 110 beats/minute at the beginning of a rest period, shorten the next work cycle by about 1/3. Also, you should not lose more than 1.5% of your total body weight in a day. If you do, drink fluids to compensate and prevent dehydration.

- Send worker to a cool shelter immediately if any of the following are noticed: heat rash, heat cramps (muscle spasms, pain in hands, feet or abdomen), heat exhaustion (pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting), heat stroke (red, hot, usually dry skin; lack of perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma).

- First aid: remove protective clothing and equipment and wrap the victim in wet towels or clothing. If there are signs of heat exhaustion or heat stroke, seek medical attention immediately.

### HEAVY EQUIPMENT

Special safety procedures are required when working around operating heavy equipment. For the Work Plan, there is potential for working around heavy equipment, such as drill rigs. Hazards associated with operating heavy equipment include obstructed view, moving parts, overhead clearance, and noise. In general,

- Heavy equipment should be operated only by trained authorized personnel.

- Equipment should be inspected daily.

- Equipment should be equipped with backing alarms.

- Personnel working on the equipment or in the area should wear safety glasses, steel-toe safety boots, and hard hats.

- All safety switches must be operational.

- Drill rigs should remain at least 20 feet from overhead power lines and should not be moved with the boom raised.

- Non-essential personnel should remain a safe distance from these operations.

## 4.4 TRAFFIC

Road traffic is a major safety concern for this project. As a majority of activities will occur within 25 feet of Colfax Avenue, extreme caution must be taken with all activities. High-visibility safety vests must be worn at all times while working along the road. Traffic cones and "Men Working" signs should also be used. Special care should be taken during high-traffic times of the day. Along Colfax Avenue, these generally occur between 6:30 and 8 AM, around noon, and between 3:30 and 5 PM.

## 4.5 BIOLOGICAL HAZARDS

There is potential for site personnel to come in contact with certain biological hazards.

Biological - Occupationally induced infection can occur in any occupation as a result of exposure to bacteria, viruses, fungi, or parasites. A simple laceration from a sharp edge can become secondarily infected. A thorn, a wood splinter, or a metal slug acting as a foreign body can pave the way for secondary infection of the skin. Cuts, scrapes, or other lacerations should be cleaned, disinfected, and dressed immediately following standard first aid procedures.

Plants – A broad variety of plants and wood cause injury to skin through primary irritation or allergic sensitization. Examples include poison ivy and sumac. Site personnel are required to wear long plants while at the Site. Contact with poisonous plants should be avoided. If skin contact is made with poisonous plants, the exposed area will be washed with soap and water followed by rubbing alcohol. Seek medical advice if severe reaction occurs.

Insects – Insect bites and stings can be serious to hypersensitive persons and even deadly depending on the type of insect. Examples include bees, wasps, hornets, brown recluse spiders, and ticks. Avoid tall grassy areas or other areas of thick vegetation. If work is performed in these areas, personnel should wear light colored clothing (for easy tick spotting) and a commercially available repellant, and check for ticks regularly.

Animals – Animal bites are a concern because of the potential for the animal to carry the rabies virus, which attacks the nervous system. If an animal bite occurs the victim must be taken to the nearest medical facility immediately.

## 4.6 UTILITIES

All utilities must be cleared before performing any intrusive activities, such as monitoring well installation. The SSO will verify that utilities have been cleared before work begins at the site. See Section 3.5 for further information on utility clearance.

## 4.7 NOISE

Hearing protection is required when working in close proximity to heavy equipment, such as drill rigs, if the level of noise interferes with communication or the sound level exceeds 85 decibels (dB). Hearing protection is required within 25 feet of the following operations:

- Driving the split spoon sampler
- During core drilling

Hearing protection must always be worn when using these pieces of equipment:

- Using power tools
- Using an air compressor

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# APPENDIX A

# ISOTEC'S HEALTH AND SAFETY PLAN

ISOTEC

# *HEALTH AND SAFETY PLAN*

AMERICAN CHEMICAL SERVICE NPL SITE
GRIFFITH, INDIANA

FEBRUARY 23, 2004

*PREPARED FOR*

MWH AMERICAS, INC.
175 WEST JACKSON BLVD., SUITE 1900
CHICAGO, ILLINOIS 60604

*PREPARED BY*

IN-SITU OXIDATIVE TECHNOLOGIES, INC.
51 EVERETT DRIVE, SUITE A-10
WEST WINDSOR, NEW JERSEY 08550

ISOTEC PROJECT NO. 800636

# HEALTH AND SAFETY PLAN

**SITE:**

**AMERICAN CHEMICAL SERVICE NPL SITE**
**GRIFFITH, INDIANIA**

**FEBRUARY 23, 2004**

**PREPARED FOR:**

**MWH AMERICAS, INC.**
**175 WEST JACKSON BOULEVARD**
**SUITE 1900**
**CHICAGO, ILLINIOS 60604**

**PREPARED BY:**

**IN-SITU OXIDATIVE TECHNOLOGIES, INC.**
**51 EVERETT DRIVE**
**SUITE A-10**
**WEST WINDSOR, NEW JERSEY**

**ISOTEC PROJECT NO. 800636**

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## HEALTH AND SAFETY PLAN/CONTINGENCY PLAN

## DISCLAIMER

THIS SITE HEALTH AND SAFETY/CONTINGENCY PLAN HAS BEEN DEVELOPED FOR THE USE OF IN-SITU OXIDATIVE TECHNOLOGIES, INC. (ISOTEC) AND ITS EMPLOYEES. PROPERLY TRAINED AND EXPERIENCED ISOTEC SUB-CONTRACTORS MAY ALSO USE IT AS A GUIDANCE DOCUMENT. HOWEVER, ISOTEC DOES NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THE SITE.

DUE TO THE POTENTIALLY HAZARDOUS NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS, WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE WITHOUT PRIOR RESEARCH BY TRAINED HEALTH AND SAFETY SPECIALISTS.

ISOTEC CLAIMS NO RESPONSIBILITY FOR USE OF THE PLAN BY OTHERS. THE PLAN IS WRITTEN FOR THE SPECIFIC SITE CONDITIONS, PURPOSES, DATES AND PERSONNEL SPECIFIED AND MUST BE AMENDED IF THESE CONDITIONS CHANGE.

## *Section 1 PROJECT IDENTIFICATION*

| | |
|---|---|
| **CLIENT NAME:** | MWH Americas, Inc. |
| **CLIENT ADDRESS:** | 175 West Jackson Boulevard, Suite 1900<br>Chicago, Illinois 60604 |
| **ISOTEC PROJECT No.:** | 800636 |
| **PROJECT NAME:** | American Chemical Service, Inc. NPL Site |
| **LOCATION/ADDRESS:** | Griffith, Indiana |
| **ISOTEC TECHNICAL MANAGER:** | Prasad Kakarla or Mike Temple |
| **ISOTEC PROJECT MANAGER:** | Prasad Kakarla or Mike Temple |
| **ISOTEC SITE MANAGER:** | Mike Temple or Kevin O'Neal |
| **ISOTEC SITE SAFETY OFFICER:** | Mike Temple or Kevin O'Neal |
| **PLAN VALID FROM:** | February 2004 |
| **PLAN EXPIRES:** | December 2004 |

**– End of Section –**

# *Section 2 INTRODUCTION*

The purpose of this Health and Safety Plan (HASP) is to identify, evaluate and control health and safety hazards, and to provide for emergency response during in-situ chemical oxidation remedial field activities at the site. All employees of ISOTEC, as well as its contractors and subcontractors who have agreed to abide by this HASP and who are involved in field activities on this project, will be bound by these provisions.

This site-specific HASP is based on a review and evaluation of the potential hazards and risks associated with this project. It outlines the health and safety procedures, and the equipment required, needed to minimize the potential for harm to field personnel and site visitors. Since work activities, site conditions and exposures to various combinations of contaminants, which may be present, are variable, the potential for adverse health effects associated with field activities on this site cannot be predicted with confidence.

## *2.1 Site Description & History*

The American Chemical Service, Inc. (ACS) site is located southwest of intersection of Reder Road and South Colfax Street in Griffith, Indiana. Past business activities at the site have resulted in soil and groundwater impacted with volatile organic compounds (VOCs) and petroleum hydrocarbons. Contaminants of concern (COCs) at the site are gasoline related VOCs, primarily benzene, toluene, ethylbenzene and xylenes (BTEX), along with total petroleum hydrocarbons (TPH) as gasoline ranged organics (GRO) and diesel ranged organics (DRO). Levels of BTEX within the ground water have exceeded 9,700 ppb while levels of DRO and GRO have been found at 21,000 ppb and 40,000 ppb respectively. Levels of BTEX contamination in soil within the vadose zone have been found at 1,000 mg/kg while levels of DRO and GRO have been found at 2,100 mg/kg and 920 mg/kg, respectively. It has been put on the national priority list (NPL).

For this remedial treatment program ISOTEC will target ground water, saturated soils and soil/water interface soils at the 17-27' below ground surface (bgs) aquifer interval within the targeted area. The geology of the targeted portion of the aquifer is composed of fine to medium sands. Depth to ground water is approximately 18' bgs. The hydraulic conductivity has been calculated at $2 \times 10^{-3}$ cm/sec (5.64 ft./day). A slurry wall borders the northwest portion of the targeted plume while a residence with basement borders the northeast portion of the plume.

See Attachments A and B for the site location and street maps that identify the location and possible routes to the nearest hospital.

## *2.2 Key Personnel*

### *2.2.1 ISOTEC Project Manager: Prasad Kakarla or Michael Temple*

The ISOTEC Project Manager has the following responsibilities:

- To provide the ISOTEC Director of Health and Safety with project-related health and safety information.
- To have a site-specific Health & Safety Plan (HASP) prepared.
- To implement the HASP.
- To see that the project is performed in a manner consistent with applicable local, state and federal regulations.
- To monitor compliance with the HASP.

ISOTEC Project Manager has the authority to take the following actions:

- To suspend field activities, if the health and safety of field personnel are endangered.
- To suspend an individual from field activities for infractions of the HASP, pending further consideration by the ISOTEC DHS.

### *2.2.2 ISOTEC Director of Health and Safety: Thomas Andrews*

The ISOTEC DHS has the following responsibilities, although he will not be on-site during the work:

- To consult with the ISOTEC Project Manager in project-related matters of health and safety.
- To monitor compliance with the HASP.
- To assist the ISOTEC Project Manager in complying with the terms of this HASP, and applicable regulations.
- To verify that on-site personnel are properly trained and medically qualified to carry out their duties.

The ISOTEC DHS has the authority to take the following actions:

- To suspend work or otherwise limit personnel exposure if a HASP appears to be unsuitable or inadequate.
- To direct personnel to modify any work practices that are deemed to be hazardous to health and safety.
- To remove field personnel from the project if their physical actions or mental condition endangers their own health and safety, or that of their coworkers.

### *2.2.3 ISOTEC Site Safety Officer: Michael Temple or Kevin O'Neal*

The ISOTEC Site Safety Officer (ISOTEC SSO) will be present on-site during work. The SSO and ISOTEC Alternate Site Safety Officer(s) (Alternate ISOTEC SSO) have the following responsibilities:

- To direct on-site health and safety activities.
- To report safety-related incidents to the ISOTEC Project Manager and ISOTEC DHS.
- To assist the ISOTEC Project Manager in all aspects of implementing the HASP.
- To maintain an adequate supply of health and safety equipment on-site, as specified in the HASP.
- To observe on-site health and safety activities, as specified in the HASP, and report results to the ISOTEC Project Manager and the ISOTEC DHS.

The ISOTEC SSO has the authority to take the following actions:

- To suspend field activities, if the health and safety of field personnel are endangered.
- To suspend an individual from field activities for infractions of the HASP, pending further consideration by the ISOTEC DHS.

### *2.2.4 ISOTEC Injection Technicians: Gary Schreiber, Sean Collins & Roger Reiersen*

The ISOTEC Injection Technicians have the following responsibilities:

- To report safety-related incidents to the ISOTEC SSO.
- To comply with the HASP while working.

The ISOTEC Injection Technicians have the authority to take the following actions:

- To suspend field activities, if the health and safety of field personnel are endangered.

**– End of Section –**

# *Section 3 GENERAL HEALTH AND SAFETY REQUIREMENTS*

## *3.1 Personnel Medical Clearance*

Prior to working at this site, ISOTEC assigned employees must: 1) have been certified by a licensed, ISOTEC-approved physician as being physically able to perform their assigned field work, and to use the Personal Protective Equipment (PPE) which will be required for this project, in accordance with the provisions of OSHA Regulation 29 CFR 1910.120(f); 2) have successfully completed an ISOTEC 40-hour basic health and safety training course (Level C) for field personnel or its equivalent. Site managers and supervisors must have successfully completed an 8-hour managers' health and safety course, in addition to the other clearance requirements.

ISOTEC subcontractor employees must also have similar medical, training, and respirator fit clearances and they will be required to provide proof of clearance before beginning work.

## *3.2 Hazard Training*

All personnel working on-site who have potential exposures to health or safety hazards shall be thoroughly trained as specified in OSHA Regulations 29 CFR 1910.120(e). This training will include: (1) Attendance at an initial 40-hour basic health and safety training course off the Site; (2) At least three days of actual field experience under the direct supervision of a trained, experienced supervisor; (3) On-site, site-specific training; and (4) an 8-hour annual update in the basic health and safety training course. ISOTEC personnel may also receive specific topic training throughout the year. This training may include blood-borne pathogen training, low-level radioactivity safety, ergonomics updates, and newsletters/bulletins with pertinent or applicable information.

In addition to the above, on-site Managers and supervisors who are directly responsible for, or who supervise employees engaged in hazardous waste operations must also receive: (1) 8-hours of site supervisor training; and (2) additional training at the time of job assignment on such topics as, but not limited to, the company's safety and health program and the associated employee training program; personal protective equipment program; spill containment program; air quality monitoring; emergency response; monitoring equipment usage and calibration; and, health hazard monitoring procedures and techniques.

At the time of job assignment, special training will be provided to on-site personnel who may be exposed to unique or special hazards not covered by the initial 40-hour basic health and safety course. If unique or special hazards are unexpectedly encountered, specialized training will be provided before work proceeds.

## *3.3 Incident Reporting*

An ISOTEC Health & Safety Incident Report will be filed for any incident involving personnel working at this Site. Situations covered by this policy include, but are not limited to, fires, explosions, illnesses, injuries and motor vehicle collisions. These reports must be sent to the ISOTEC DHS within 24 hours of the incident. Worker's Compensation Insurance reports for ISOTEC employees must be filed within 48 hours of each incident or illness that results from work-related activities and requires medical attention. See Attachment C for a copy of the ISOTEC Health & Safety Incident Report. The ISOTEC SSO or Project Manager will complete this form if needed.

## *3.4 Illumination, Sanitation and Confined Space Entry*

### *3.4.1 Illumination*

All major work tasks will occur outside during daylight hours. The illumination requirements set forth by OSHA Regulations 29 CFR 1910.120 (m) will be met.

### *3.4.2 Sanitation*

The sanitation requirements regarding potable and non-potable waters, toilet facilities and washing facilities will be followed as set forth in OSHA Regulations 29 CFR 1910.120(n).

### *3.4.3 Confined Space Entry*

Confined Space Entries will not be conducted under this HASP.

## *3.5 Respirator Maintenance, Fitting and Decontamination*

Respirators will only be used when deemed necessary by the ISOTEC SSO. In the event that respirators are used, the respirators will be cleaned daily according to procedures described below. Cartridges will be replaced when breakthrough is detected at any time while in use. An increased resistance to breathing will determine breakthrough for HEPA cartridges. The following checks will be performed daily, in addition to the above:

- Exhalation valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve, which could cause leakage.
- Inhalation valves - screw off both cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place.
- Make sure a protective lens cover is in place.
- Make sure you have the proper HEPA cartridges.
- Make sure that the face piece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment.
- Make sure the speaking diaphragm retainer ring is hand tight.

**NOTE: <u>The respirator MUST be Leak-Tested before each use</u>.**

Test the respirator for leakage by using both the positive- and the negative-pressure method. Lightly place your palm over the exhalation valve cover. Exhale gently. The body of the respirator should bulge slightly outward from your face. If any leakage is detected around the face seal, readjust the head harness straps and repeat the test until there is no leakage. If leakage is detected other than in the face seal, the condition must be investigated and corrected before another test is made. The negative pressure test must also be made. Lightly place your palms or some impervious material, like Saran Wrap® over the cartridges or filter holders. Inhale gently. The face-piece should collapse against the face. The respirator must pass these two tightness tests before the respirator is used. The respirator will not furnish protection unless all inhaled air is drawn through suitable cartridges or filters.

**NOTE: Respirators provide no protection in oxygen-deficient atmospheres!**

After use, follow these steps to clean your respirator:

- Wash with Alconox® solution and brush gently. (This step will remove any soil/solid particulate matter that may have been collected on the respirator during field activities.)
- Rinse with distilled/de-ionized water, making sure that the inhalation and exhalation valves are clean and unobstructed.
- Rinse with distilled/de-ionized water.
- Wipe with sanitizing solution. (This step will assure the sterility of the respirator.)
- Allow your respirator to air dry.
- Place the respirator inside a sealed bag or a clean area away from extreme heat or extreme cold.

## *3.6 ISOTEC Project Manager Notification*

All field personnel must sign-in on a sheet maintained by the ISOTEC SSO or the Alternate ISOTEC SSO before entering the Site.

**IF ANY PREVIOUSLY UNIDENTIFIED POTENTIAL HAZARDS ARE DISCOVERED DURING ANY FIELD WORK, LEAVE THAT AREA OF THE SITE IMMEDIATELY AND CONTACT THE ISOTEC SSO FOR FURTHER INSTRUCTIONS.**

## 3.7 *OSHA Information Poster*

In accordance with the Occupational Safety and Health Act of 1970, a copy of the OSHA information poster must be present at the Site. It will be posted at full size (11" x 17") in a permanent structure or temporary field office, or will be communicated to on-site personnel via Attachment E.

## 3.8 *Prohibitions*

Smoking, eating, drinking, chewing tobacco or toothpicks, applying cosmetics, storing food or food containers, and having open fires will be permitted only in designated areas that will be established by the ISOTEC SSO. Under no circumstances will any of the above activities be permitted within the Exclusion or Contamination Reduction Zones. Good personal hygiene should be practiced by field personnel to avoid ingesting contaminants.

## 3.9 *Initial Site Safety Meeting and Signing of Health and Safety Plan Compliance Agreement*

The ISOTEC SSO will hold an initial site safety meeting with ISOTEC, subcontractor and contractor field personnel before work activities begin at the Site. At this meeting, it will be verified that all personnel have been provided with or have reviewed a HASP for the work activities to be performed at this Site. For ISOTEC personnel, its subcontractor's personnel, and contractor personnel whose employer(s) have adopted this HASP, the HASP shall be reviewed, discussed and questions will be answered. Signed Health and Safety Plan Compliance Agreement Forms of personnel who will be following this HASP will be collected by the ISOTEC SSO and filed. Individuals refusing to sign the Form will not be allowed to work on the Site.

## 3.10 *Daily Site Safety Briefings*

During field operations, site safety briefings will be held at the start of each day by the ISOTEC SSO to review and plan specific health and safety aspects of scheduled work. All field personnel who are following this HASP are required to attend these briefings. These meetings and their content shall be documented by the ISOTEC SSO or Project Manager. Each company will have a SSO. SSO's will meet each day to discuss accidents and relative risk and safety issues. Each SSO is responsible for their personnel. SSO's will agree on communication methods when health and safety actions occur. Potential subjects that may be discussed are presented below:

1. Preliminary
   - Medical clearances.
   - Training requirements.
   - Written HASP availability.
   - Designation of responsibilities for on-site personnel.
   - Identification of on-site personnel trained and certified to administer First Aid.
2. Training topics
   - Review of HASP including: types of hazards; pathways of exposure; levels of protection; contamination avoidance; prohibitions; work procedures; work zones; emergency response procedures; and, specific on-site area/work tasks of concern.
   - Decontamination.
   - Personnel Protective Equipment.
   - Air Quality Monitoring Program.
3. Questions and Answers

## *3.11 ISOTEC Material Handling and Storage*

ISOTEC employees will handle and store concentrated oxidants (i.e. hydrogen peroxide, potassium and sodium permanganate, sodium persulfate, etc.) and catalyst to complete this project. ISOTEC employees, the injection technicians and the SSO, have received training in the proper handling and storage of these chemicals. ISOTEC employees have also received specific training in the PPE required to handle and inject these chemicals safely into the subsurface.

For this project, modified Fenton's reagent has been proposed. Concentrated hydrogen peroxide (35% to 50%) and the catalyst should be stored in such a way that if a spill were to occur the two would not come into contact with each other. To avoid this, the concentrated peroxide is stored in a location separate from the catalyst. Specifically the peroxide is stored in either DOT approved 55 gallon polyethylene drums, bulk tanks or within a commercial tanker trailer on the ground outside of the ISOTEC box trucks while dry and liquid catalyst are stored inside of the box truck. Diluting the peroxide is performed prior to injection into the subsurface in a dilution tank. Water is added to the dilution tank along with dry stabilizer in a predetermined volume to create a 5-20% concentration after the addition of a predetermined volume of concentrated hydrogen peroxide. An electric drum pump or an air operated double diaphragm pump is used to transfer the concentrated hydrogen peroxide into the dilution tank. Two technicians are required to complete this process. One operates the pump and one holds the transfer wand in the dilution tank. Both technicians wear proper PPE, which can include splash shields and gloves while completing the transfer.

To mix catalyst, Catalyst 4260 Component A is added to the mixing tank followed by a predetermined quantity of water and an electric mixer is turned on to mix the solution. Catalyst 4260 Component B is then added to the solution and mixing continues. Although the mixing process is generally dust free, the technician completing the catalyst preparation can wear a dust mask as a precautionary measure.

Once the catalyst is mixed and the peroxide is diluted safety hazards associated with the reagents are minimal. Technicians should avoid contact with the liquids during injection. If contact occurs flush the affected area with water and follow the procedures outlined in the MSDS sheet.

Combustion issues associated with the presence of hydrogen peroxide, a strong oxidizer, are minimized since a maximum solution of 50% will be delivered to the site. The concentrated peroxide is stored in DOT approved drums, tanks or trailers. Flammable materials, i.e., gasoline, will not be stored near the peroxide or in locations where a spill of peroxide could occur. If concentrated peroxide does come in contact with organic materials, i.e., wood, asphalt or clothing, the areas should be rinsed with water, contained and cleaned up following the procedures in the Pollution Prevention Plan. Hydrogen peroxide at a concentration of 35%-50% is insufficient to cause instantaneous combustion of non-flammable organic materials. The ISOTEC reagents are not mixed at the surface. The peroxide and catalyst only come into contact with one another in the subsurface. Precautions are taken, by flushing all equipment with water, between separate injections of each reagent. Typical temperature rise at the point of injection due to ISOTEC's modified Fenton's reagent process is 10°C to 20°C.

**– End of Section –**

# *Section 4 HAZARD ASSESSMENT*

An assessment of the known or suspected chemical, physical and biological hazards has been made for each of the activities specified below.

## *4.1 Approved Work Activities*

Work activities, which may be performed under this HASP, are limited to the following:

- In-situ chemical oxidation treatment, consisting of a mixture of oxidizers and catalysts conveyed into subsurface using mechanical equipment such as drum or pneumatic diaphragm pumps, under a pressurized or gravity type feed system
- Reagents are delivered through an injection pathway system, which may consist of permanent injection points/wells, direct push points. drilled boreholes (sometimes followed by subsurface fracturing) and infiltration trenches.

This HASP does not cover any site activities beyond those specifically listed above. Work activities not described above may be conducted only after an appropriate Addendum to this HASP has been issued by the ISOTEC DHS.

## *4.2 Hazards*

Potential hazards associated with the project are discussed below. Specific hazards associated with ISOTEC reagent handling and storage are discussed in Section 3.11.

### *4.2.1 Temporary Drive Point Installation*

Although ISOTEC employees will not be drilling, direct push operations are proposed for this project and will occur while ISOTEC employees are on-site. The hazards involved with the use of drill rigs are significant and include noise, pinch points, entrapment in machinery, impact from moving parts, electrocution from contact with over head wires or buried utilities, and improper operations. Use of hand tools, moving the rigs/equipment, and conducting required repairs could increase physical risks. Working with and around a drill rig can involve a high risk of serious injury or death. In order to reduce the risk, proper safety precautions, including the use of hearing protection, must be observed at all times. See Attachment H.

### *4.2.2 Environmental Contaminants*

The following chemical information presents the significant contaminants that have been previously identified or routinely encountered during groundwater sampling activities within the site boundaries.

#### *4.2.2.1 Chemical Hazards*

The following chemical hazards have been identified, based on documented prior site uses, initial site investigations and/or proposed remedial action.

1. Benzene, Toluene, Ethyl benzene & Xylenes (BTEX)
2. Chlorobenzene, Dichlorobenzene & Trichlorobenzenes
3. Isopropylbenzene
4. Methylcyclohexane
5. Hydrogen peroxide (35% to 50%)
6. Catalyst complex (inorganic salts)

### *4.2.2.2 Chemical Exposure Controls*

Contaminants usually enter the body through the mouth (ingestion), the lung (inhalation) or by absorption through the skin and mucous membranes. Chemical exposure through these routes will be controlled by limiting eating, drinking, and smoking to uncontaminated areas; through the use of hygiene practices and decontamination procedures; and by the use of appropriate engineering controls and personal protective equipment (PPE). There are four levels of personal protection (Levels A, B, C, and D), according to the degree of protection they afford, with Level A providing the greatest degree of protection. The initial level of personal protective equipment to be used while performing activities at the Site will be Modified Level D.

The contaminants known to be present in the soils and groundwater at the site do not have the capacity to become airborne during the subsurface injection of reagents, due to their confined nature in the subsurface. Therefore, the monitoring program outlined in Section 5, if deemed necessary, is considered to be protective of the surrounding areas, outside of the work zone.

### *4.2.3 Physical Agents*

Physical agents include noise, electro-magnetic fields, ionizing and non-ionizing radiation and thermal stress. There is also a risk of physical injury from slips, trips, falls, cuts, sprains, etc., when working in the field with sampling tools and when near heavy equipment, operating machinery and vehicular traffic. Field personnel should be able to recognize these hazards and take steps to avoid injurious contact with them. The following precautions must be observed whenever heavy equipment is in use:

- Personal protective equipment (PPE) such as steel-toed shoes, safety glasses or goggles, and hard hats must be worn whenever such equipment is present.
- Personnel must at all times be aware of the location and operation of heavy equipment, and take precautions to avoid getting in the way of its operation. Never assume that the equipment operator sees you; make eye contact and use hand signals to inform the operator of your intent, particularly if you intend to work near or approach the equipment. Keep all non-essential personnel out of the work area.
- Never walk directly in back of or to the side of, heavy equipment without the operator's acknowledgment.
- When an equipment operator must operate in tight quarters, the equipment subcontractor should provide a person to assist in guiding the operator's movements.
- Any heavy equipment that is used in the exclusion zone should remain in that zone until its task is completed. The equipment subcontractor should completely decontaminate such equipment in the designated equipment decontamination area as required prior to moving the equipment outside of the Exclusion Zone.

**Noise Exposure**

Work at the site may be conducted with high noise levels from equipment such as excavators, pumps and drill rigs. ISOTEC standards require that hearing protection be used when noise levels exceed 85 dBA, averaged over an 8-hour day. Hearing protection will be required at this site for noise exposures greater than 85 dBA for **any** length of time. Hearing protection will be worn anytime a normal conversation cannot be heard. ISOTEC and subcontractor personnel shall have hearing protection on-site and available for use at all times.

**Thermal Stress**

Depending on the altitude, geographic location and the season, the use of required PPE may cause heat or cold related stress on the wearer. The Heat Stress Casualty Prevention Plan as specified in Attachment-F will be referred to for dealing with this health hazard during warm weather. The Plan outlines heat stress identification, treatment, prevention and monitoring. Fluids will be provided at all times during work periods, in order to maintain adequate body fluid levels for field personnel.

**Electro-magnetic fields**

Field activities may include the use of electricity via a portable generator supplied by ISOTEC. To protect on-site personnel from the risk of shock/electrocution, the portable generator shall be equipped with a ground fault circuit interrupter (GFCI).

Radiation Exposures

Radiation is used to mean ionizing and non-ionizing, laser and microwave emissions. No sources of these forms of radiation are known to exist on-site.

#### *4.2.3.1 Controls for Physical Agents*

No physical hazards, as defined, are known or believed to be present.

### *4.2.4 Biological Agents*

Biological agents may be viral, fungal, bacterial, or of higher orders: insects (including ticks and stinging insects), wild animals (especially snakes) and domesticated animals. Any mammal encountered on-site should be considered potentially rabid. In many parts of the northeast United States, tick-borne diseases pose a significant health risk during warm months (see Attachment J, ticks and Tick-Borne Diseases). Field personnel are encouraged to use insect repellents before donning PPE. To avoid snakebites check for snakes before walking through grassy or debris strewn areas. The presence of medical waste suggests the possibility that pathogenic micro-organisms may be present. A fully stocked first aid kit, insect and tick repellent (wear appropriate) must be available for use in the field.

#### *4.2.4.1 Biological Agent Controls*

No biological agents, as defined, are known or believed to be present.

### *4.2.5 Safety Hazards*

Use of steel-toed work boots, safety glasses or goggles will be required when in an Exclusion Zone. Personnel should be aware that when PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

### *4.2.6 Pressurized Injection*

Field activities typically involve reagents to be conveyed into subsurface with some form of mechanical equipment. Based on subsurface permeability at a site, a pressurized delivery system may or may not be required. When a pressurized system is used, extreme caution must be exercised to prevent serious personal injury or property damage as with the use of any pressure operated equipment or pressurized systems. Safety procedures are outlined in Attachment-K.

### *4.2.7 Spill Control and Countermeasures*

During implementation of in-situ chemical oxidation, large volumes of reagents are typically transported, stored, mixed and injected. The reagents for this project include a proprietary solubilized iron catalyst, concentrated hydrogen peroxide solution (<50%), and potable water. The reagents are prepared and transferred from 55-gallon DOT-approved containers and/or small bulk storage tanks. To control a spill, release, or surfacing of reagents or reagent material in an unpaved area, the affected area will be surrounded by a soil containment berm. The iron catalyst is not considered to have an adverse impact on soils. Hydrogen peroxide solution is a corrosive material, however, by containing the spill and adding soil to the affected area, the hydrogen peroxide will be neutralized by the organic material in the soil.

In the event of spill or release on a paved surface, the affected area will be rinsed with large amounts of water away from site buildings or structures towards unpaved surfaces (if accessible). In the case of hydrogen peroxide solution, the rinsing will provide a dilution effect that will minimize any potential hazard before it degrades naturally.

**– End of Section –**

# *Section 5 AIR QUALITY MONITORING AND MEASURES FOR THE CONTROL OF EMISSIONS*

## *5.1 Air Quality Monitoring Instrument*

ISOTEC personnel will not monitor air quality during the in-situ chemical oxidation remedial field activities. However, in the event that it is deemed necessary by the SSO, air quality may be measured to determine exposure potentials prior to the start of work, and at various times during the course of the project. Instruments which may be used to monitor air quality, are discussed below:

**Photoionization Detector**

The HNu Systems Model PI-101 Photoionization Detector (PID) or equivalent will be used to detect trace concentrations of certain organic gases and a few inorganic gases in the air. Methane, ethane, and the major components of air are not detected by the HNu PID. PID readings reflect total (readable) vapors in the air. PID readings must be given as "PID units", rather than "ppm". The PID detects mixtures of compounds simultaneously. PID readings do not measure concentrations of any individual compound when a mixture of compounds is present.

The PID will be calibrated twice each day (before start of work and after the conclusion of work) using an isobutylene standard (molecular weight = 56.2) for calibration. Calibrations will be logged. PID readings should be measured in the breathing zone of the most highly exposed worker (i.e., the person who is closest to the source of known or suspected contamination) at least hourly.

**Flame-Ionization Detector**

The Foxboro Model-108 Flame-Ionization Detector (FID) or equivalent will be used to detect trace concentrations of certain organic gases in the air. The FID is capable of detecting methane, ethane, and similar compounds in air that are not detected by a PID. The FID detects mixtures of compounds simultaneously. FID readings do not measure concentrations of any individual compound when a mixture of compounds is present.

The FID will be calibrated twice each day (before start of work and at the conclusion of work) using an isobutylene standard for calibration. Calibrations will be documented. FID readings should be measured in the breathing zone of the most highly exposed worker (i.e., closest to the source) at least hourly.

**Combustible Gas Indicator/Oxygen/Hydrogen Sulfide Meter**

An approved Combustible Gas Indicator/Oxygen Meter, which may have a separate hydrogen sulfide detector, may be used, at the discretion of the ISOTEC SSO, to measure the concentration of flammable vapors and gases, oxygen, and hydrogen sulfide in the air during field activities. Flammable gas concentrations are measured as percentages of the Lower Explosive Limit (LEL). Oxygen content is measured as a percentage of air. Hydrogen sulfide concentration (which includes sulfur dioxide) is measured in parts per million.

**Multigas Detector Tubes**

Draeger Multigas Detector Tubes may be used at the discretion of the ISOTEC SSO to detect and semi-quantify the concentration of selected contaminants in the air. The tubes must be able to detect concentrations at or below the OSHA Permissible Exposure Limit (PEL) for the contaminant in question. It should be realized that most detector tubes will also respond to chemically similar organic vapors.

**Personal Monitor for Aerosol and Dust**

The MIE, Inc. Model PDM-3 MiniRAM Personal Monitor for Aerosol and Dust (MiniRAM Monitor), or equivalent, will be used at the discretion of the ISOTEC SSO to detect and quantify the concentration of fugitive respirable dust that may be created during ground-disrupting operations. The instrument is capable of measuring fugitive respirable dust at concentrations as low as 0.1 $mg/m^3$. The miniRAM may be used to estimate the concentration of metals or other non-gaseous contaminants, if their soil concentrations are known. Soil levels are normally reported as milligrams per kilogram of soil (mg/kg). This is equivalent to $10^{-6}$ mg of contaminant per mg of soil. Since the miniRAM readout is milligrams of total (soil) dust per cubic Meter of air ($M^3$), the soil analysis concentration can be divided by 'one million' and multiplied by the miniRAM reading in order to estimate the contaminant concentration in air.

## 5.2 Air Quality Response Levels

In the event that air monitoring is required, the Site Safety Officer will decide when to change protection levels in response to air monitoring results. The ISOTEC DHS will be notified of any upgrades from initial protection levels, as soon as is practical. ISOTEC Action Levels for this project are described in detail in Table 5-1, at the end of this Section. These Action (Response) Levels apply to the work activities covered by this HASP.

## 5.3 Monitoring Guidelines

### 5.3.1 Background Organic Vapor Monitoring

In the event that air monitoring is required, background organic vapor and combustible gas readings may be taken at least twice daily: before the start, and after the conclusion of work activities. Background levels will be taken at locations surrounding the site that are unaffected by on-site work. Once work at the site begins, reselection of the original background location may be required.

### 5.3.2 Air Monitoring Protocol

In the event that air monitoring is required, at least one series (series=PID and CGI) of readings will be taken every 15 minutes during intrusive work activities (i.e. drilling, excavation). If no increase in readings, above action levels, are observed after one hour of monitoring, the frequency will be reduced to once every 30 minutes. If no increase in readings, above action levels, are observed after one hour of monitoring, the frequency will be reduced to once each hour. During non-intrusive work activities, one series will be performed at the start of work, one series at some point during the work, and one near the conclusion of the work. This will be in addition to the background monitoring described in the previous section.

### 5.3.3 Documenting Monitoring Results

A calibration log will be kept for each of the monitoring instruments used, which describes the calibration method(s) used, and the readouts obtained. Should work at the site require respiratory protection, the need for a personal exposure monitoring program will be evaluated by the ISOTEC DHS. Details of this program and any monitoring equipment required for its implementation will be specified in an Addendum to this HASP prepared by the ISOTEC DHS. Records of exposure measurements will be maintained in the Health and Safety file for this project.

## 5.4 Emission Control Measures

Vapor or dust emissions resulting from field operations do not usually exceed either regulatory or ISOTEC action levels. If the action levels are **significantly** exceeded, measures to suppress the responsible emissions should be investigated. Appropriate measures would include cessation of operations until the exact cause of the emission is identified and corrected. Vapor control may include the use of vapor suppression foams, covering exposed soil piles with plastic sheeting and/or spraying exposed soil piles and drilling sites with water or enzyme solutions. Fugitive dust emission control may require water spraying. In addition, calcium chloride may be needed.

# TABLE 5-1

## ISOTEC RESPONSE ACTIONS

### ISOTEC Air Quality Measurements and Response Actions

| Air Quality Measurement[1] | Response Action |
|---|---|
| PID reading less than 3 units above background (averaged over 1 minute)<br>CGI reading less than 10% LEL<br>Oxygen Meter reading between 19.5% and 25% | Level D Protection or Modified Level D Protection (at the discretion of the ISOTEC SSO) |

(1) All Air Quality Measurements, with the exception of CGI measurements for flammable vapors and gases, should be made in the breathing zone of personnel who, in the opinion of the ISOTEC SSO, are most exposed to airborne contaminants. Measurements of flammable vapor and gas levels should be made in the vicinity of the nearest ignition source.

| Air Quality Measurement | Response Action |
|---|---|
| PID reading greater than 3 units, and less than 8 units above background (averaged over at least 1 minute)<br>CGI reading 10-25% of LEL<br>Oxygen Meter reading between 19.5% and 25%. | Level C Protection |

| Air Quality Measurement | Response Action |
|---|---|
| PID reading 8 units or more above background (avg. over at least 1 minute)<br>CGI reading > 25% LEL<br>Oxygen Meter reading less than 19.5% | Suspend all work activities in immediate area and notify ISOTEC Director of Health and Safety and ISOTEC Project Mgr.<br>Continue air monitoring until readings indicate that work may resume. |

**NOTE: CGI readings are unreliable in atmospheres with less than 19.5% oxygen!!**

**- End of Section -**

# *Section 6 PERSONAL PROTECTIVE EQUIPMENT*

## *6.1 Description of Levels of Protection*

The personal protection equipment specified in this HASP will be available to all ISOTEC field personnel. The following requirements will also be met, in accordance with OSHA regulations:

1. Facial hair may not interfere with the proper fit of respirators;
2. Contact lenses will not be worn on-site, without exception.
3. Eyeglasses that interfere with the proper fit of full-face respirators will not be worn.
4. No eating, drinking or smoking will be allowed in any area where respiratory protection is required.

**Level D Personal Protective Equipment**

- Safety glasses or goggles
- Steel-toed leather or rubber work boots
- Hearing protection (if warranted)
- Traffic vest (if warranted)

**Modified Level D Personal Protective Equipment**

- Hard hat[1]
- Safety glasses or goggles
- Steel-toed leather work boots
- Rubber overboots, steel-toed rubber boots, or disposable "booties" [1]
- Nitrile-butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Dust Mask [1]
- Face Shield [1]
- Polyethylene coated or Saranex impregnated Tyvek coveralls[1] (taped at cuffs)
- Hearing protection (if warranted)
- Traffic vest[1]

[1] Optional, at the discretion of ISOTEC SSO.

**Level C Personal Protective Equipment (not called for under this plan)**

- Hard hat
- Half-face Air-Purifying Respirator with applicable chemical cartridge combined with a HEPA filter
- Steel-toed leather work boots
- Rubber overboots, steel-toed rubber boots, or disposable "booties"
- Nitrile-butadiene rubber outer gloves
- Nitrile surgical gloves (to be worn underneath outer gloves)
- Polyethylene coated or Saranex impregnated Tyvek coveralls (taped at cuffs)
- Hearing protection if warranted.

A first aid kit, multi-purpose dry chemical UL Class 10A-10B-C fire extinguisher, eye wash station (bottle), appropriate barricades and alarm horns will be present and maintained at the Site.

Selection of the PPE specified for this project is based on a review of known or suspected hazards, routes of potential exposure (inhalation, skin absorption, ingestion, and skin or eye contact) and the effectiveness of personal protective equipment in providing a barrier to these hazards. In addition, PPE has been selected to match the work requirements and task-specific conditions of the job, and to provide adequate protection without causing unnecessary discomfort or physical impairment to the worker.

## *6.2 Initial PPE Levels for Specific Work Tasks*

The selection of Initial Levels-of-Protection takes into consideration the physical, biological and chemical hazards posed by the site as well as those posed by the various pieces of personnel protective clothing. Initial Levels-of-Protection are established so as to obtain acceptable levels of protection while not imposing an unacceptable level of physical stress on the wearer.

The following initial PPE levels have been established for the tasks described in Section 4.1, Approved Work Activities:

| Work Activity | Level of Protection |
|---|---|
| ISOTEC catalyst preparation | Modified Level D |
| ISOTEC catalyst injection | Modified Level D |
| Initial soil penetration with Geo-Probe equipment | Modified Level D |
| ISOTEC oxidizer preparation and injection | Modified Level D |
| Reagent injection | Modified Level D |

**- End of Section -**

# *Section 7 DESIGNATION OF WORK ZONES*

This section of the Health & Safety Plan applies to excavation projects where contaminated soils are exposed and may release their contaminants to the air, or come in contact with field personnel. To minimize the migration of contaminant from the Site to uncontaminated areas, three work zones will be set up:

Zone 1: Exclusion Zone

Zone 2: Contamination Reduction Zone

Zone 3: Support Zone

The Exclusion Zone is the area where contamination occurs or could occur. Initially, the Exclusion Zone should extend a distance of 25 ft from the edge of intrusive activity unless conditions at the Site warrant either a larger or smaller distance as determined by the ISOTEC SSO. All persons entering the Exclusion Zone must wear the applicable level of protection as set forth in Section 6.1, Personal Protective Equipment and Section 6.2, Initial PPE Levels for Specific Work Tasks. It is anticipated that work zones will be established at each individual area of intrusive work rather than encompass the entire Site.

The Support Zone is the area of the Site where significant exposure to contamination is not expected to occur during non-intrusive activities. The Support Zone is considered to be the "clean area" of the Site.

Between the Exclusion Zone and Support Zone is the Contamination Reduction Zone, which provides a transition zone between the contaminated and clean areas of the Site. The Contamination Reduction Zone will be located directly outside of the Exclusion Zone. All personnel must decontaminate when leaving the Exclusion Zone. A Contamination Reduction Zone (decontamination area) will be established adjacent to each individual area of intrusive work.

**- End of Section -**

# *Section 8 DECONTAMINATION PROCEDURES*

Contamination reduction procedures appropriate for the existing work area will be developed and specified by the SSO. Such procedures must be in place before site operations begin, and they must remain in place (modified as necessary) throughout the period of activity. Wherever possible, the need for decontamination should be reduced through work practices that minimize contact with contaminants. Personnel should avoid walking through heavily contaminated areas, should not kneel or directly touch contaminated materials, and should use remote handling and sampling techniques when feasible.

Decontamination will be performed only in designated areas. Separate areas may be set up for equipment and personnel.

## *8.1 Personnel Decontamination*

Personnel who have been in contact with contaminated materials will decontaminate themselves in the following manner:

- Deposit contaminated equipment on plastic drop cloths.
- Stand in wash tub containing Alconox® and water, wash boots and outer gloves with long handled brush.
- Rinse boots and outer gloves with long handled brush in a wash tub containing clear water or use a sprayer to rinse off boots and gloves.
- Remove ankle and wrist tapes; place in disposal drum.
- Remove outer gloves and place in disposal drum.
- Remove Tyvek® suit and place in disposal drum.
- Remove respirator and place on table to be decontaminated.
- Remove inner gloves and place in disposal drum.
- Wash hands and face.

## *8.2 Equipment Decontamination*

Equipment which might require decontamination includes heavy equipment, tools, monitoring equipment, sampling equipment, and sample containers; trucks and trailers; and the decontamination equipment itself when the decontamination is closed down. Before entering the site, all equipment will be cleaned to remove grease, oil, encrusted dirt, or other potential contaminants.

All tools or equipment, which have been in contact with contaminated materials, must be decontaminated after leaving the Exclusion Zone. This decontamination is to be performed using a high pressure/hot water "steam type" cleaner or a spray/rinse decontamination sequence as described in Section 3.5, Respirator Maintenance, Fitting and Decontamination, as appropriate.

Contaminated liquids from the decontamination area and contaminated clothing will be disposed of in accordance with site protocols.

## *8.3 Disposal of Decontamination Wastes*

Solid and liquid decontamination waste will be containerized. Solids may be double bagged, or placed in a sealed drum or similar container. Liquids will be collected during decontamination and placed in sealed containers or pumped into holding tanks for future testing and disposal. Containers must be clearly labeled for content, the operation from which they were filled, and the dates.

**- End of Section -**

# *Section 9 EMERGENCY RESPONSE PLAN*

## *9.1 Emergency Response*

Emergencies addressed by this plan include:

- Fire;
- Chemical over-exposures;
- Physical injuries to site personnel; and,
- Chemical spills.

**NOTE:** Check to see if emergency services will be provided by American Chemical Service, or if outside, municipal/volunteer providers must be contacted once an emergency occurs.

The ISOTEC Health & Safety Officer and Project Manager must be notified as soon as possible of any on-site emergency or potential emergency including fire, explosive conditions or OSHA-recordable physical injury.

## *9.2 Emergency Recognition and Prevention*

### *9.2.1 Fires*

Fires are possible whenever oxygen and flammable gases or vapors are mixed together in proper proportions and an ignition source is present. Construction equipment provides an ignition source. To prevent fires and explosions, a CGI as specified in Section 5.0 will be used to detect flammable or explosive atmospheres. Ignition and other sources which produce electrical sparks will be turned off and the area evacuated if vapors or gases reach 25% of the Lower Explosion Limit (LEL) as measured by the CGI. Work will not resume until the ISOTEC SSO observes CGI readings below 25% of the LEL for at least 5 consecutive minutes.

### *9.2.2 Chemical Exposures*

Work should always be performed in a manner that minimizes exposure to contaminants through skin or eye contact, inhalation or ingestion. Work practices to reduce the risk of chemical exposure include:

- PPE, as specified in Section 6.0, will be used by all field personnel covered by this HASP. A formal revision to the HASP must be made by the ISOTEC DHS to modify the PPE specifications.
- Keep hands away from face during work activities.
- Minimize all skin and eye contact with contaminants.

Early recognition of the signs and symptoms of chemical exposure is essential for the prevention of serious chemical exposure incidents. Symptoms of exposure to the compounds present at the Site include the following:

Hydrogen peroxide (35-50%%): Produces intense irritation of contacted skin and mucous membranes. Destruction of tissue and blistering is possible. Contact with the eyes may result in the loss of vision.

Catalysts: May produce mild irritation of the eyes and mucous membranes.

VOCs (including TCE, PCE, cis-1,2-DCE, Ethylbenzene, Toluene, Total Xylenes, VC and CT), TPHC and PCBs:

Inhalation – Causes headache, dizziness, drowsiness and nausea. Affects may lead to unconsciousness.

Ingestion – Causes abdominal pain, burning sensation. Symptoms parallel those following inhalation exposure.

Skin Contact – Causes mild skin irritation. Symptoms include redness, itching and pain. May be slowly absorbed through the skin with possible systemic effects.

Eye contact – Vapors cause mild eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

If a person experiences any of these acute symptoms, or recognizes any of them in a fellow worker, the person experiencing the symptoms will stop work immediately and report to the ISOTEC SSO. If the symptoms persist or affect performance in any way, the ISOTEC SSO will arrange for medical treatment. If the symptoms are serious, or affect several people, work activities in the exposure area will be discontinued until more is known about the cause(s). Incident reporting procedures as specified in Section 3.3 will be initiated.

#### *9.2.2.1 Eye Wash Bottle*

In the event of hazardous chemical contact with eyes, portable eye wash bottles will be available for immediate treatment. Prior to field activities, all personnel to be entering the Exclusion Zone will be instructed on the location of the eye wash bottles and its operating procedure by the Site Safety Officer during the Site Safety Meeting.

**Any personnel involved in a hazardous chemical eye contact incident requiring use of the site eye wash bottle may be required to seek further medical assistance/evaluation as directed by the Site Safety Officer.**

### *9.2.3 Physical Injuries*

Site personnel should be on the lookout for potential safety hazards such as holes or ditches; improperly positioned objects, such as drums or equipment that may fall; sharp objects, such as nails, metal shards, and broken glass; protruding objects at eye or head level; slippery surfaces; steep grades; unshored steep entrenchments, uneven terrain or unstable surfaces, such as walls that may cave in or flooring that may give way. Site personnel should inform the ISOTEC SSO of any potential hazards observed so that corrective action can be taken.

### *9.2.4 Spill Prevention*

Site personnel should be aware of potential conditions that could cause a spill and take preventative measures before a spill occurs. Hydrogen peroxide and catalyst will be stored in such a way that if a spill of either were to occur the two would not come into contact with each other. Safe storage and handling procedures are discussed further in Sections 3.11 and 4.2.6. The tanks used to dilute the peroxide and to mix and store the catalyst are oversized to prevent spillage from the tanks. If a small spill, less than five gallons of peroxide occurs to the ground surface water will be used to dilute it further and actions taken to prevent the fluid from entering the any storm drains or drainage ditchs, while the fluid is soaked up with clay sorbent. If a larger spill of peroxide occurs the same procedure will be followed and any excess liquid will be pumped into a clean empty storage tank. The iron catalyst is not considered to have an adverse impact on soils. If a small spill, less than 5 gallons, of catalyst occurs it should be contained and allowed to percolate into the subsurface. If a large spill of catalyst occurs it will be contained and pumped into the storage tank with an air diaphragm pump. If a spill of dry catalyst occurs it will be swept up and placed in a poly bag. **If any spill occurs work will stop immediately until the spill is cleaned up and the cause of the spill is determined and corrected**. All spilled materials will be disposed of properly. Refer to the appropriate MSDS sheet for proper disposal instructions.

In the event of spill or release on a paved surface, the affected area will be rinsed with large amounts of water away from site buildings or structures towards unpaved surfaces (if accessible). In the case of hydrogen peroxide solution, the rinsing will provide a dilution effect that will minimize any potential hazard before it degrades naturally.

## *9.3 Emergency Alerting Procedures*

The ISOTEC SSO will alert the appropriate work groups when an emergency occurs. The appropriate phone numbers for key project personnel are listed below in Section 9.5. The ISOTEC SSO and any isolated work group will carry radios if direct contact cannot be maintained. If direct contact cannot be maintained, an air horn will be used to signal workers to stop work and assemble in the Contamination Reduction Zone. If evacuation of the Site is necessary, a pre-arranged signal from the air horn will be sounded.

## *9.4 Evacuation Procedures and Routes*

Normally, personnel should evacuate through the Contamination Reduction Zone, and from there, to the Support Zone. Evacuation from the Contamination Reduction Zone will proceed in an upwind direction from the

emergency. If evacuation to the Support Zone does not provide sufficient protection from the emergency, personnel will be advised to evacuate the Site proper.

## *9.5 Telephone Numbers for Emergency Services and Contacts*

The telephone numbers of local emergency services are given below:

| Emergency Service | Telephone Number |
|---|---|
| Ambulance | 911 |
| Fire Department | 911 |
| Police Department | 911 |
| Hospital | Community Hospital @ (219) 836-1600 |
| Poison Control Center | (800) 222-1222 |
| USEPA National Response Center | (800) 424-8802 |
| MWH Task Manager | Matthew Mesarch @ (312) 831-3423 |
| ISOTEC Office | (609) 275-8500 |
| ISOTEC PM | Michael Temple – Cellular Phone @ (732) 278-0809 |

These telephone numbers must be verified by the ISOTEC SSO before the start of field work.

## *9.6 Emergency Response Personnel*

The ISOTEC SSO will have the primary role in responding to all emergencies at the Site. The ISOTEC SSO, or the Alternate ISOTEC SSO, will be present at the Site during all work activities. If any emergency such as a fire, chemical exposure, or physical injury occurs, the ISOTEC SSO shall be notified immediately. The ISOTEC SSO will direct all site personnel in cases of emergency.

After an emergency has occurred at the Site, the causes and responses to that emergency shall be thoroughly investigated, reviewed and documented by the ISOTEC Project Manager and ISOTEC SSO; this documentation is to be submitted to the ISOTEC DHS within 48 hours of the incident.

## *9.7 Decontamination Procedures During an Emergency*

Decontamination of an injured or exposed worker or during a site emergency shall be performed only if decontamination does not interfere with essential treatment or evacuation.

If a worker has been injured or exposed and decontamination can be done: Wash, rinse, and/or cut off protective clothing and equipment.

If a worker has been injured or exposed and cannot be decontaminated:

- Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel;
- Alert emergency and off-site medical personnel to potential contamination; and,
- Have the ISOTEC SSO or other personnel familiar with the incident and contaminants at the Site accompany the victim to the hospital. If possible, send a copy of the appropriate MSDS(s) with the victim.

## *9.8 Emergency Medical Treatment and First Aid Procedures*

Emergency medical treatment or First Aid may be administered at the Site by the ISOTEC SSO or other personnel who have been certified in First Aid.

General emergency medical and First Aid procedures are as follows:

- Remove the injured or exposed person(s) from immediate danger.
- Render First Aid as needed; decontaminate affected personnel, if necessary.
- Call an ambulance for transport to local hospital immediately. This procedure shall be followed even if there is no apparent serious injury.
- Evacuate other personnel at the Site to safe places until the ISOTEC SSO determines that it is safe for work to resume.
- Report the accident to the ISOTEC DHS immediately.

Emergency Medical Treatment and First Aid Procedures are presented in Attachment-G.

## *9.9 Directions to the Hospital from Site*

The route and/or directions to the hospital from the Site are in Attachment-B. The directions to the hospital from the site must be verified by the ISOTEC SSO prior to the start of field work.

**- End of Section -**

# *Section 10 PERSONNEL ASSIGNMENTS*

## *10.1 Project Personnel*

ISOTEC personnel authorized to enter the Site and work on this project, subject to compliance with provisions of the HASP, are:

| | |
|---|---|
| ISOTEC Project Manager | Prasad Kakarla or Michael Temple |
| ISOTEC Site Manager | Michael Temple or Kevin O'Neal |
| ISOTEC Site Safety Officer | Michael Temple or Kevin O'Neal |
| ISOTEC Director of Health and Safety | Thomas Andrews |
| ISOTEC Injection Personnel | Gary Schreiber, Sean Collins or Roger Reiersen |

Other personnel who meet HASP requirements, including training and participation in a medical surveillance program, may enter and work on the Site subject to compliance with provisions of the HASP.

## *10.2 Project Safety Responsibilities*

Personnel responsible for implementing this Health and Safety Plan are the ISOTEC Project Manager and the ISOTEC Site Safety Officer. Their specific responsibilities and authority are described in the ISOTEC Health and Safety Manual.

**- End of Section -**

# *Section 11 HEALTH AND SAFETY PLAN APPROVALS*

The authorized signatures below verify that this Health and Safety Plan has been read and approved for the work to be performed at the subject site:

ISOTEC Case Name: MWH/American Chemical Services NPL Site, Griffith, Indiana

ISOTEC Case Number: 800636

| | |
|---|---|
| Prasad Kakarla<br>ISOTEC Project Manager | Date |
| Thomas Andrews<br>ISOTEC Director of Health and Safety | Date |

**- End of Section -**

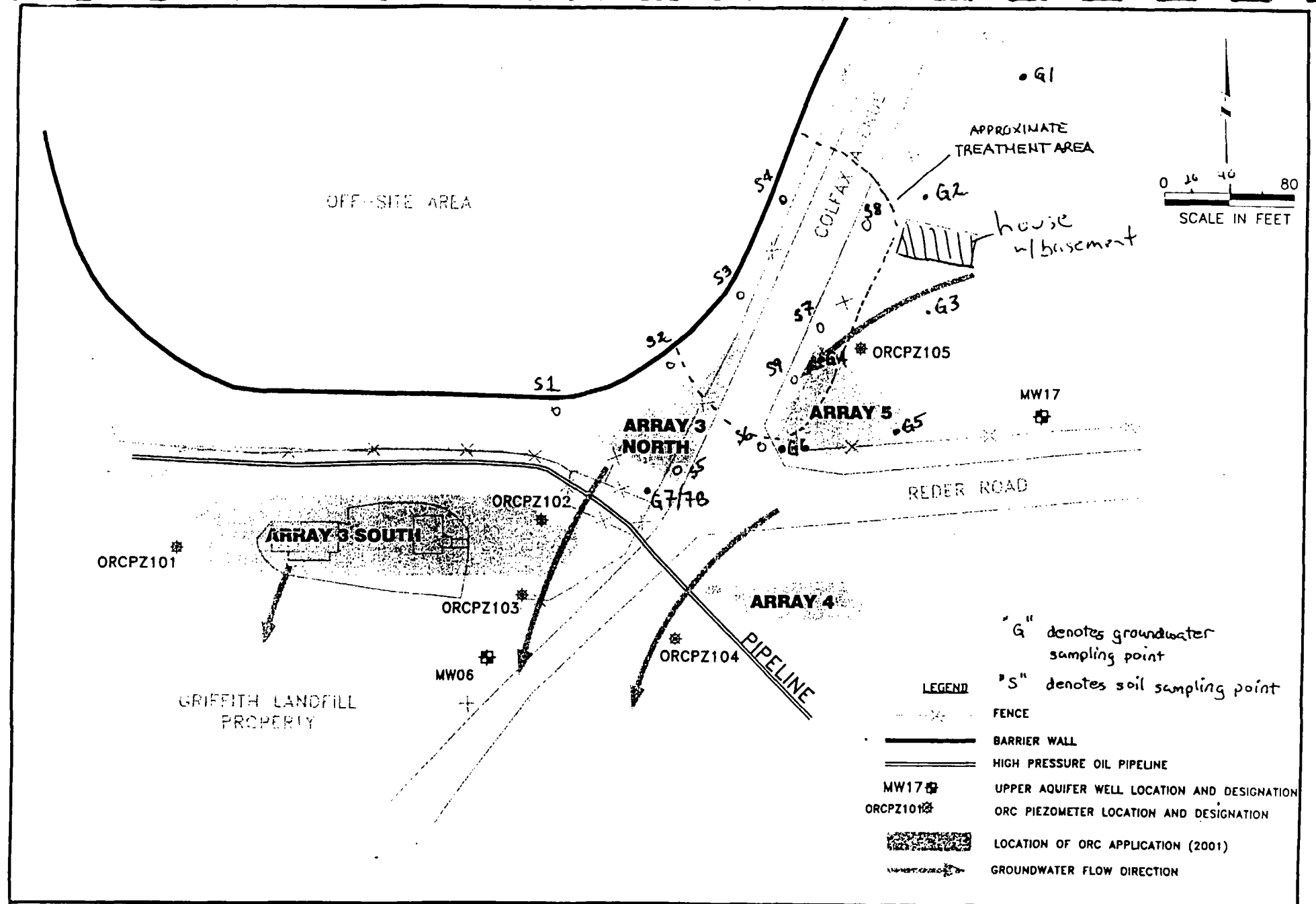
## *Section 12 HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT*

I have reviewed a copy of the Health and Safety Plan for MWH/American Chemical Services NPL Site, in Griffith, Indiana, dated February 20, 2004. I have read the HASP, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the Health and Safety Plan.

| Name (print) | Company |
|---|---|
| Signature | Date |
| Name (print) | Company |
| Signature | Date |
| Name (print) | Company |
| Signature | Date |
| Name (print) | Company |
| Signature | Date |
| Name (print) | Company |
| Signature | Date |

## ATTACHMENT A

**SITE LOCATION MAP**




MWH

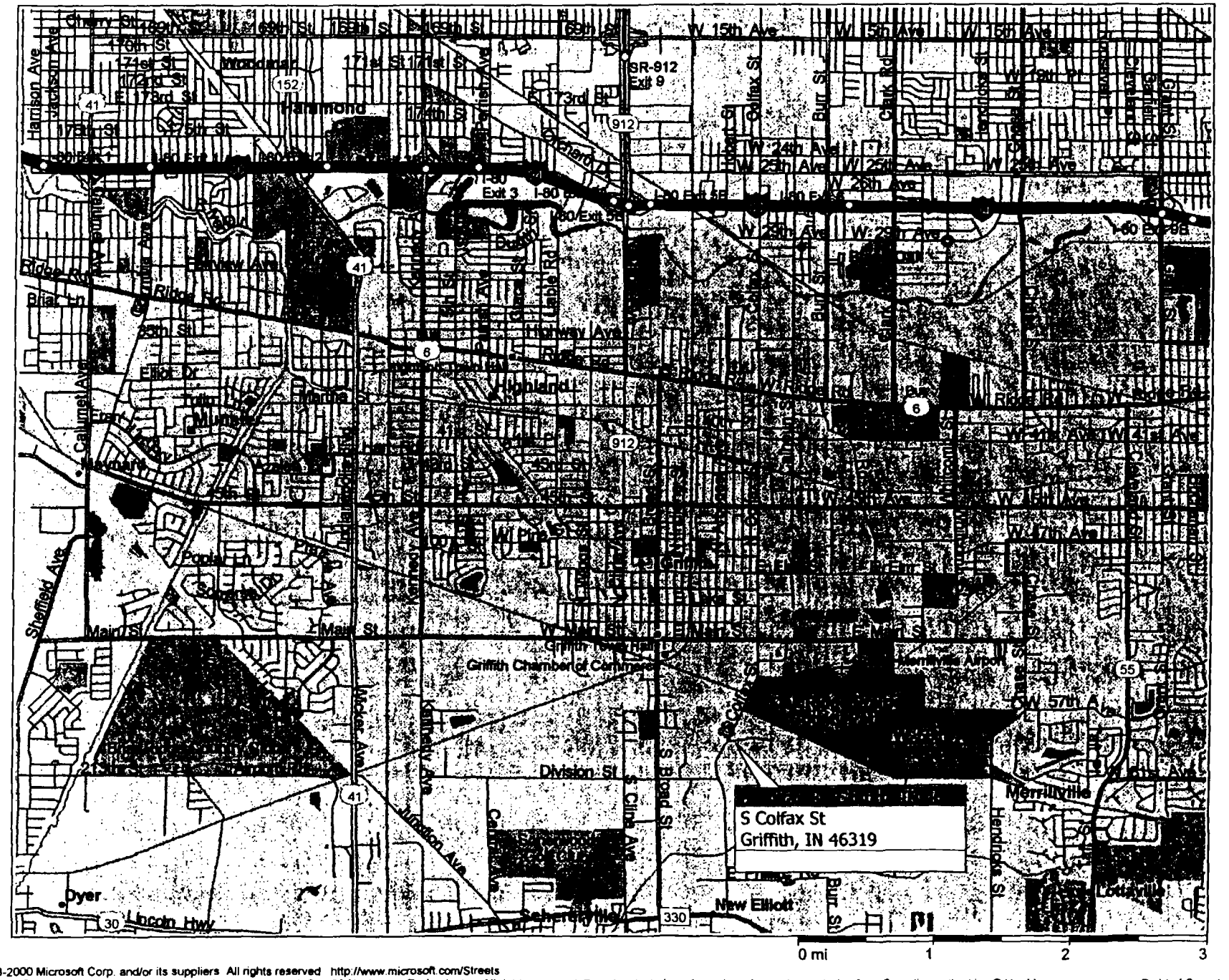
SOUTH AREA ORC PILOT STUDY
AMERICAN CHEMICAL SERVICE NPL SITE
GRIFFITH, INDIANA

SOUTH AREA PILOT STUDY

FIGURE 2

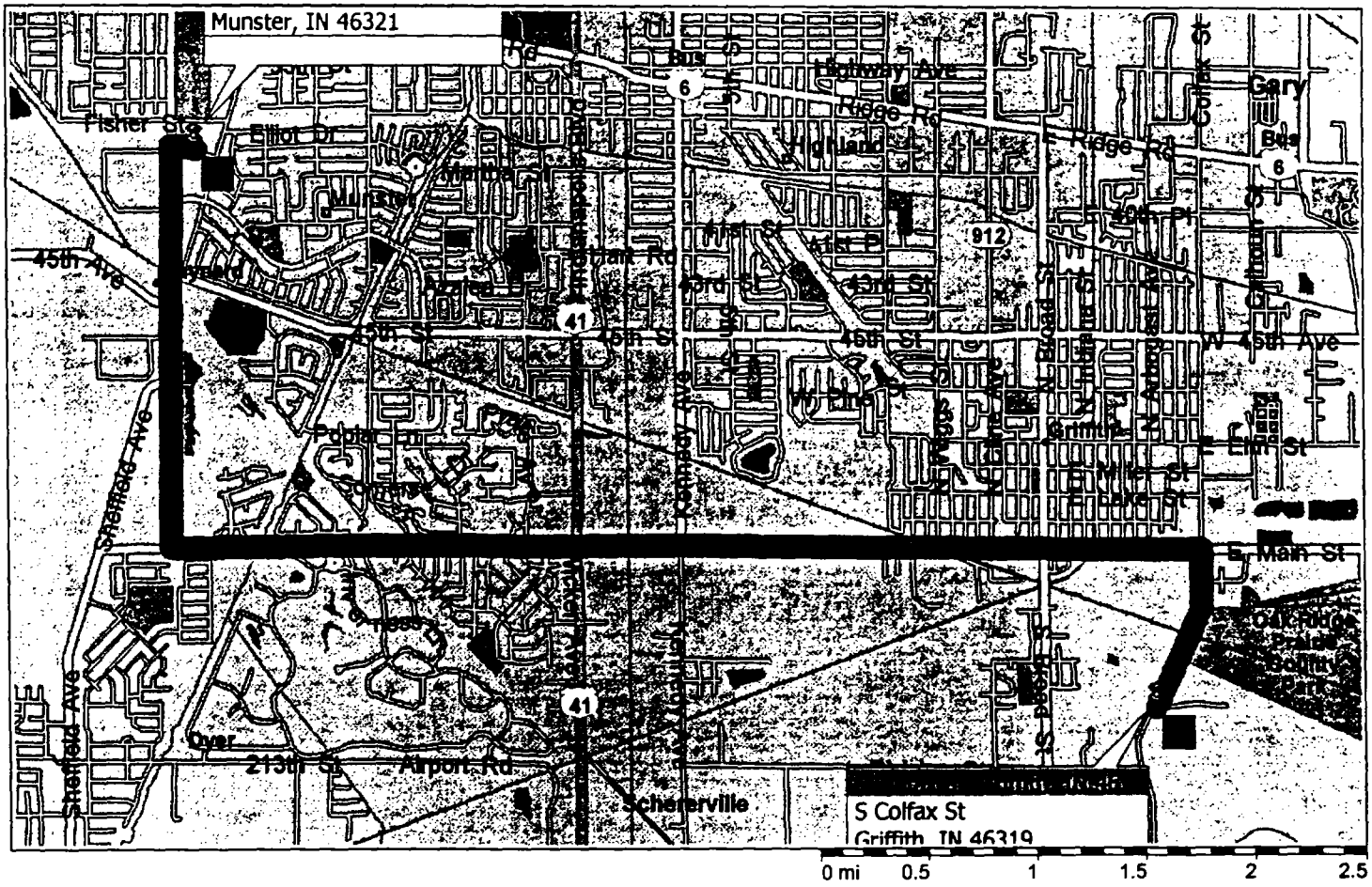
L:\700\0601.ACS\0100.ORC_South\Drawings\2000\01_ORC_SOUTH_2.dwg, 06/13/02 10:16:07 AM

# Griffith, Indiana, United States



## ATTACHMENT B

### EMERGENCY ROUTE MAP

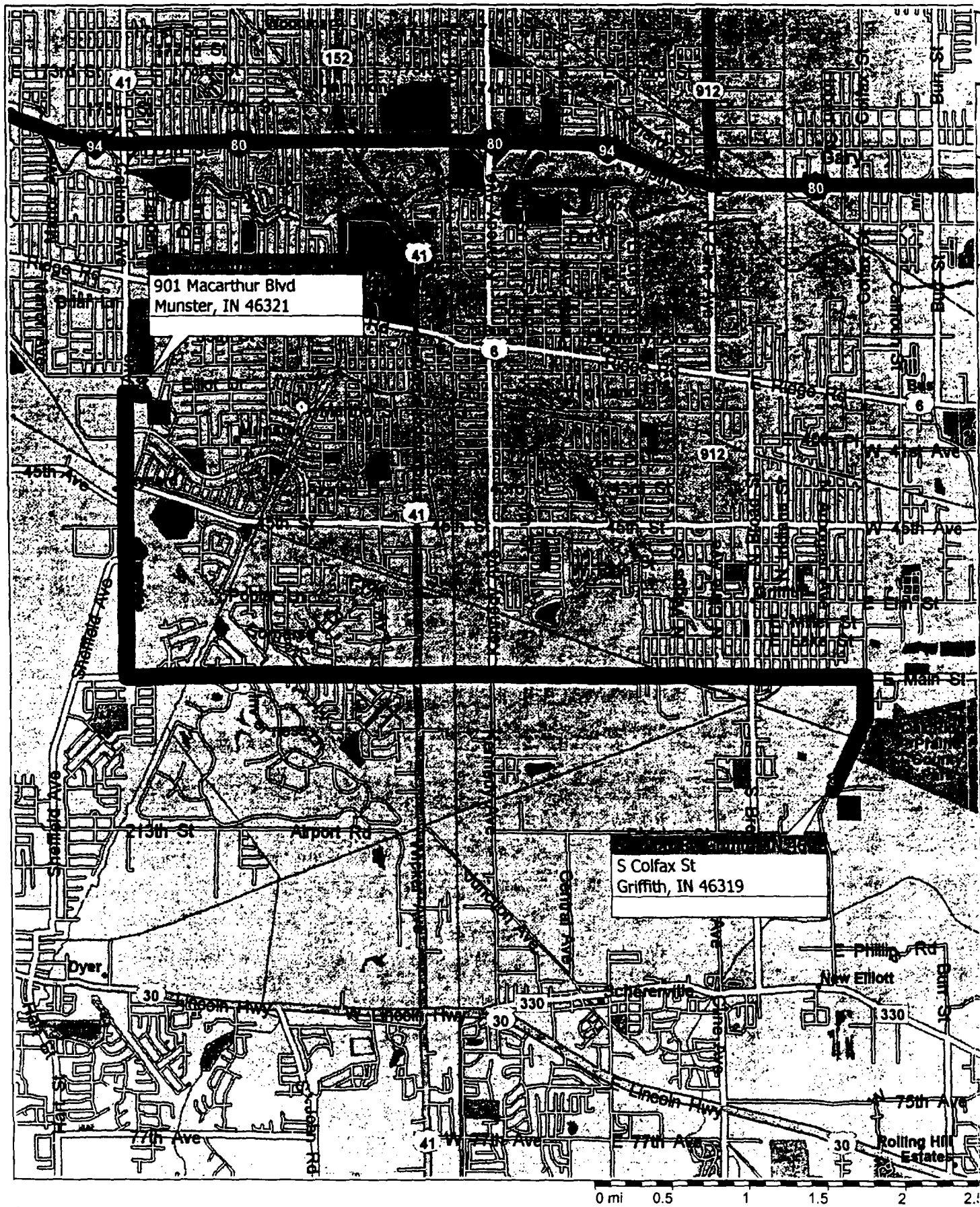



| | | |
|---|---|---|
| 9:00 AM | 0.0 mi | ■ Depart S Colfax St, Griffith, IN 46319 [S Colfax St, Griffith, IN 46319] on S Colfax St (North-East) for 0.8 mi |
| 9:02 AM | 0.8 mi | Turn LEFT (West) onto (E) Main St for 5.0 mi |
| 9:13 AM | 5.8 mi | Turn RIGHT (North) onto Calumet Ave for 1.9 mi |
| 9:17 AM | 7.7 mi | Turn RIGHT (East) onto McArthur Blvd [Macarthur Blvd] for 0.1 mi |
| 9:17 AM | 7.8 mi | ■ Arrive 901 Macarthur Blvd, Munster, IN 46321 [901 Macarthur Blvd, Munster, IN 46321] |

COMMUNITY HOSPITAL
901 MACARTHUR BLVD.
MUNSTER, IN
219-836-1609

# S Colfax St, Griffith, IN 46319 to 901 Macarthur Blvd, Munster, IN 46321

**7.8 miles; 17 minutes**



## ATTACHMENT C

# HEALTH & SAFETY INCIDENT REPORT

# IN-SITU OXIDATIVE TECHNOLOGIES, INC

## HEALTH & SAFETY INCIDENT REPORT

## Form HS-102

**Date/Time of Incident:** _____

**Project Name:** MWH/American Chemical Service NPL Site

**Project Location:** Griffith, Indiana

**Project Number:** 800636

**DESCRIPTION OF INCIDENT (Describe what happened and possible cause, identify individuals involved, witnesses, and their affiliations, and describe emergency or corrective action taken.)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**Reporter:** _____ _____ _____

Print Name Signature Date

Reporter must deliver this report to the ISOTEC Director of Health and Safety within one day of the date of incident for medical treatment cases or vehicle accidents and within five days for other incidents.

**Reviewed By:** Thomas Andrews _____ _____

Print Name Signature Date

**ATTACHMENT D**

## PROJECT SAFETY LOG

## IN-SITU OXIDATIVE TECHNOLOGIES, INC

### PROJECT SAFETY LOG

### Form HS-106

**ISOTEC SSO:**_____ **Date:**_____

**Weather:**_____

**Personnel:**

| Personnel Present | Affiliation | Work Activities | Level of Protection |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**PID (ppm)**

| Reading | Time | Reading | Time | Reading | Time |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**CGI/$O_2$ (%LEL)**

| Reading | Time | Reading | Time | Reading | Time |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**CGI/$O_2$ ($O_2$%)**

| Reading | Time | Reading | Time | Reading | Time |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## PROJECT SAFETY LOG (cont. – page 2)

## Form HS-106

**Colormetric Tubes (ppm)**

| Reading | Time | Reading | Time | Reading | Time |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**MiniRam ($mg/m^3$)**

| Reading | Time | Reading | Time | Reading | Time |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Notes and Comments:**_____

## ATTACHMENT E

**OSHA POSTER**

# You Have a Right to a Safe and Healthful Workplace.

# IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

## 1-800-321-OSHA

## www.osha.gov

**U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165**

# You Have a Right to a Safe and Healthful Workplace.

# IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
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## 1-800-321-OSHA
## www.osha.gov

**U.S. Department of Labor** • **Occupational Safety and Health Administration** • **OSHA 3165**

**ATTACHMENT F**

# HEAT AND COLD STRESS GUIDELINES

## HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

### IDENTIFICATION AND TREATMENT

- **Heat Exhaustion**

Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, skin is clammy, and may perspire profusely. The pulse is weak and fast, breathing is shallow. The victim may faint unless victim lies down. This may pass, but sometimes it remains and death could occur.

First Aid: Immediately remove the victim to the Contamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outerwear. Call a physician. Treat the victim for shock. (Make victim lie down, raise feet 6 to 12 inches and keep victim warm but loosen all clothing). If the victim is conscious, it may be helpful to ingest sips of a salt-water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

- **Heat Stroke**

Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107 degrees Fahrenheit to 110 degrees Fahrenheit. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

First Aid: Immediately evacuate the victim to a cool and shady area in the Contamination Reduction Zone. Remove all protective outerwear and all personal clothing. Lay victim on back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place victim in a tub of cool water. The main objective is to cool victim without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

### PREVENTION OF HEAT STRESS

- One of the major causes of heat casualties is the depletion of body fluids. On the site there will be plenty of fluids available. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.
- A work schedule should be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.
- A work/rest guideline will be implemented for personnel at all anticipated PPE levels. This guideline is as follows:

| Level D: | | Level B and C: | |
|---|---|---|---|
| Ambient Temp. | Max. Work Period | Ambient Temp. | Max. Work Period |
| Above 90°F | 1 hours | Above 90°F | 1/2 hours |
| 80° to 90°F | 2 hour | 80° to 90°F | 1 hour |
| 70° to 80°F | 4 hours | 70° to 80°F | 2 hours |
| | | 60° to 70°F | 3 hours |
| | | <60°F | 4 hours |

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations.

## HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degrees Fahrenheit, workers must be monitored for heat stress after every work period.

- Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degrees Fahrenheit.

- Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 pound. BWL should not exceed 1.5% of the total body weight. If it does, workers should be instructed to increase their daily intake of fluids by the weight lost.

Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

## COLD EXPOSURE CASUALTY PREVENTION PLAN

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ear, are the most susceptible.

### EFFECTS OF COLD EXPOSURE

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 mile per hour (mph) is equivalent in chilling effect to still air at -18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Local injury resulting from cold is included in the generic term frostbite. There are severe degrees of damage. Frostbite of the extremities can be categorized into:

- **Frost nip or incipient frostbite:** characterized by suddenly blanching or whitening of skin.
- **Superficial frostbite:** skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- **Deep Frostbite:** tissues are cold, pale, and solid; extremely serious injury.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water between 102 degrees Fahrenheit and 105 degrees Fahrenheit. Give a warm drink not coffee, tea or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help.

- Do not rub the frostbitten part (this may cause gangrene).
- Do not use ice, snow, gasoline or anything cold on frostbite.
- Do not use heat lamps or hot water bottles to rewarm the part.
- Do not place the part near a hot stove.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature, it symptoms are usually exhibited in five stages; 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95 degrees Fahrenheit; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and, finally, 5) death.

As a general rule, field activities should be curtailed if equivalent chill temperature (degrees Fahrenheit) is below zero unless the activity is of an emergency nature. The ultimate responsibility for proposing on delaying work at a site due to inclement weather rests with the ISOTEC Site Safety Officer.

# ATTACHMENT G

## EMERGENCY PROCEDURES

## EMERGENCY MEDICAL TREATMENT AND FIRST AID PROCEDURES

If an employee working at the Site is physically injured, emergency medical treatment and/or First Aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, they will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered, and transportation to local emergency medical facility awaited.

If the injury to the worker is chemical in nature (e.g., overexposure), the following procedures are to be instituted as soon as possible:

- Eye Exposure - If contaminated solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash stations using large amounts of water and lifting the lower and upper lids occasionally. Obtain medical attention immediately. (Contact lenses are not permitted in the Exclusion Areas.)
- Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash contaminated skin using soap or mild detergent and water. If solids or liquid penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medial attention immediately if symptoms warrant.
- Breathing - If a person breathes in large amounts of organic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.
- Swallowing - If contaminated solid or liquid has been swallowed and the person is conscious, feed the person large quantities of salt water immediately and induce vomiting (unless the person is unconscious). Obtain medical attention immediately.

**FIRST AID PROCEDURES**

- Remove the injured or exposed person(s) from immediate danger.
- Render first aid if necessary, decontaminate affected personnel, if necessary.
- Call an ambulance for transport to local hospital immediately. This procedure should be followed even if there is no apparent serious injury.
- Evacuate other personnel on-site to a safe place until the ISOTEC Site Safety Officer determines that it is safe for work to resume.
- Report the accident to the ISOTEC Director of Health and Safety immediately.

# ATTACHMENT H

## DRILLING PROCEDURES

## SAFETY GUIDELINES FOR DRILLING

Drill rig maintenance and safety is the responsibility of the drill rig operator. The following is provided as a general guideline for safe drilling practices on-site.

### OFF-ROAD MOVEMENT OF DRILL RIGS

The following safety guidelines related to off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gullys, ruts and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4x4, 6x6, etc., vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.
- Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the drill rig has been moved to a new drilling site, set all brakes and/or locks. When grades are steep, block the wheels.
- Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.
- Tie down loads on the drill rig and support trucks during transport.

### OVERHEAD AND BURIED UTILITIES

The use of a drill rig near electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. electricity can shock, it can burn, and it can cause death.

Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.

Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 feet. In general, the distance between the overhead power line and the boom should be no less than the height of the boom.

Keep in mind that both hoist and overhead power lines can be moved toward each other by the wind.

Drilling personnel should double-check any side underground electrical and piping drawings prior to initiating drilling. If an obstruction is encountered during drilling, proceed with extreme caution until the possibility of an exposed electrical line or combustible product pipeline is excluded.

### CLEARING THE WORK AREA

Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling should not be commenced when tree limbs, protruding objects, unstable ground or site obstructions or debris cause unsafe tool handling conditions and/or limited, awkward work spaces. An area clear of obstructions or debris should be maintained 180 degrees around the drilling or sampling activities, where practical.

NOTE: In coordination with the drilling crew, the Site Safety Officer will review the precautions taken to insure that the drill rig is leveled and stabilized.

## HOUSEKEEPING ON AND AROUND THE DRILL RIG

The first requirement for safe field operations is that the drilling crew safety supervisor understands and fulfills the responsibility for maintenance and "housekeeping" on and the drill rig.

Suitable storage locations should be provided for all tools, materials and supplies so that they can be conveniently and safety handled without hitting or falling on a member of the drill crew or a visitor, without creating tripping hazards, and without protruding at eye or head level.

Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.

Pipe, drill rods, bit casings, augers and similar drilling tools should be orderly stacked on racks or sills to prevent spreading, rolling or sliding.

Penetration of other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.

Work areas, platforms, walkways, scaffolding and other access ways should be kept free of materials, obstructions and substances such as ice, excess grease or oil that could cause a surface to become slick or otherwise hazardous.

Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.

Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

Welding gas cylinders should be stored in an upright position to avoid gas leaks.

## SAFE USE OF HAND TOOLS

There are almost an infinite number of hand tools that can be used on or around a drill rig. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs.

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer, for any purpose, wear safety glasses and require all others near you to wear safety glasses.
- When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and orderly stored when not in use.
- Replace hook and heel jaws when they become visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

## SAFE USE OF WIRE LINE HOISTS, WIRE ROPE AND HOISTING HARDWARE

The use of wire line hoists, wire rope and hoisting hardware should be as stipulated by the American Iron and Steel Institute's Wire Rope User's Manual.

All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weaving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware and any other feature that would lead to failure. Wire ropes should be replaced when inspection indicates excessive damage according to the wire rope users manual.

If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 ft of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands.

Most sheaves on drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig. Wire ropes must be properly matched with each sheave.

When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanisms of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanisms of the drill.

Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however, drills may be moved using the main hoist as the wire rope is pulled through proper sheaves according to the manufacturer's recommendations.

When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch or the front or rear of the vehicle or drill rig carrier and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.

Minimize shock loading of a wire rope - apply loads smoothly and steadily.

The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- Clutches and brakes of hoists should be periodically inspected and tested.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire ropes or hoist drums with your hands.
- Follow the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Safety rules described in OSHA Regulations 29 CFR 1926.552 and guidelines contained in the Wire Rope User's Manual published by the American Iron and Steel Institute shall be used whenever wire line hoists, wire rope, or hoisting hardware are used.
- Never hoist loads over anyone's head.

- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tool during rotation.
- The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must insure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatsoever.
- Never place your hands between the drill rig and an auger, even when attempting to free a damaged or bound Shelby tube from the auger.
- Never use your hands or feet to move cuttings away from the auger.
- Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

## SAFETY DURING ROTARY AND CORE DRILLING

Rotary drilling tools should be safety checked prior to drilling:

- Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
- Drill rod chuck jaws should be checked periodically and replaced when necessary.
- The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string plus other expected hoisting loads. All cables should be inspected daily.

Special precautions that should be taken for safety rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulations blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
- All hydraulic lines should be periodically inspected for integrity and replaced as needed.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.
- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with a rough surface, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

## START UP

All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine.

Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct non-actuating positions and the cathead rope is not on the cathead before starting a drill rig engine.

## GENERAL SAFETY DURING DRILLING OPERATIONS

Safety requires the attention and cooperation of every worker and site visitor.

Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.

Before raising the mast (derrick) look up to check for overhead obstructions. (Refer to previous Section on overhead and buried utilities).

Before raising the mast (derrick), all drill rig personnel and visitors (with exception of the operator) should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.

Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be re-leveled if it settles after initial set up. Lower the mast (derrick) only when leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.

Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.

The operator of a drill rig should only operate a drill rig from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill rig.

Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.

Watch for slippery ground when mounting and dismounting from the platform.

All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open boreholes should be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.

"Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.

Be careful when lifting heavy objects. Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not the muscles in your lower back.

Drilling operations should be terminated during an electrical storm.

The minimum number of personnel necessary to achieve the objectives shall be within 25 ft of the drilling or sampling activity. Back-up personnel should remain at least 25 ft from the drilling or sampling activity, where practical.

Hardhats and steel boots are to be worn by all personnel in the vicinity of the drilling activities. Drilling personnel should not wear loose-fitting or baggy clothing, which may be awkward or get caught on equipment. Jewelry, including rings and necklaces, should not be worn around electrical wires or rotating equipment.

**ATTACHMENT I**

# EXCAVATION PROCEDURES

## SAFETY GUIDELINES FOR EXCAVATIONS

This procedure contains general safety requirements for excavating and trenching operations and work performed therein. The requirements are consistent with standards established by the Occupational Safety and Health Administration (OSHA) and described in OSHA Regulations 29 CFR 1926, Subpart P. The latter should be consulted for additional information.

### RESPONSIBILITY AND APPLICABILITY

The ISOTEC Project Manager is responsible for ensuring that employees of ISOTEC and of firms contracted by ISOTEC comply with these requirements.

These procedures are applicable to all ISOTEC projects in which trenching or other excavating operations, exclusive of borings, are performed by firms under contract to ISOTEC. It is also applicable to ISOTEC projects requiring ISOTEC personnel or firms under contract to ISOTEC to enter trenches and other types of excavations.

### REQUIREMENTS

When planning any excavating operation, obtain a permit, if required, from the proper authority.

Before digging, determine if underground installations, such as sewer, water, fuel, or electrical lines may be encountered and, if so, determine the exact locations of the lines. Information can be obtained by contacting Underground Service Alert (consult local telephone directory for toll-free number), local utility companies and the owner of the property on which the excavating operations are planned.

Trees, boulders, and other surface encumbrances, located so as to pose a potential hazard to employees must be removed or made safe before the operation begins.

Excavated materials must be placed at least 2 ft from the edge of the excavation and precautions must be taken to prevent the materials from falling into the excavation.

### SHORING AND SLOPING

Excavations in which personnel are required to work must be shored or sloped to an angle of repose if the depth of the excavation is 5 ft or more. When a shoring system is used, it shall consist of hydraulic shores or the equivalent, with sheathing or sheet piling as needed. The shoring system must be properly designed and installed to sustain all existing and expected loads. For details on shoring and sloping, consult OSHA Regulations 29 CFR, Subpart P, Section 1926.650 to 1926.653.

### ACCESS

When work is to be performed in an excavation, safe access to the excavation must be provided by means of ladders, stairs, or ramps. Trenches greater than 4 ft in depth must have ladders spaced no less than 25 ft apart, and the ladders must extend at least 3 ft above the ground surface.

### HAZARDOUS ATMOSPHERES

At sites where oxygen deficiency or hazardous concentrations of flammable or toxic vapors or gases may be encountered in excavations, the atmosphere in the excavations must be tested by the ISOTEC Site Safety Officer or other qualified person before work in the excavation begins and at appropriate intervals afterward.

### INSPECTION OF EXCAVATIONS

Excavations must be inspected daily by the ISOTEC Site Manager or ISOTEC Site Safety Officer. If evidence of potential cave-ins or slides is observed, all work in the excavation must be suspended until necessary steps have been taken to safeguard employees.

### OPERATION OF VEHICLES NEAR EXCAVATIONS

When vehicles or heavy equipment must operate near an excavation, the sides of the excavation must be shored or braced as necessary to withstand forces exerted by the superimposed load. Stop logs or other types of secure barriers must be installed at the edges of the excavations.

## BARRICADES AND FENCES

Excavated areas must be completely guarded on all sides with barricades or fences, as appropriate. If barricades are used, they must be spaced no more than 20 ft apart and shall not be less than 3 ft high when erected. A yellow or yellow and black tape, at least 1 inch wide, shall be stretched between the barricades.

## BACKFILLING

Excavated areas must be backfilled and all associated equipment must be removed from the area as soon as practical after work is completed.

**ATTACHMENT J**

# TICKS AND TICK-BORNE DISEASES

## TICKS AND TICK-BORNE DISEASES

Field personnel should be aware of an increased occurrence of tick-borne disease in the United States. In the northeast, the most likely carriers are the whitefooted mouse and the white-tailed deer. These animals are most prevalent in areas where suburban environments about open fields or woodlands. Although exposure is increased in these areas, other carriers, such as dogs and horses, can be found in a variety of environments.

All field personnel should take proper precautions to limit exposure to ticks and tick-borne diseases. These include:

- Cinching and taping clothing at the ankles and wrists, especially the ankles. Ticks lie low on grass blades and shrubs. They encounter your feet, ankles or lower legs and then crawl upward.
- Wear light-colored clothing to facilitate spotting the ticks, and check your clothing periodically. Be especially careful in terrain with tall grass, bushes or woods.
- Use a tick repellant on skin or clothing. Always read the labels before using. Clothing repellents should never be used on the skin.
- Recognize the signs of a bite or an infection. It takes several hours for a tick to attach and feed; removing it promptly lessens the chance of being infected.

Pregnant women should be particularly careful since the effects of the most common tick-borne disease in the northeast, Lyme disease, upon the fetus is unknown.

If a tick is discovered on the skin, it is important to remove the entire insect as soon as possible. The most effective method is to grasp the tick as close as possible to the mouth with tweezers or thin, curved forceps. Then, without jerking, pull it upward steadily (a small amount of skin may be removed in the process).

After removing the tick, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). Don't handle the tick; spirochetes could enter the body through breaks in the skin. Dispose of it in alcohol or flush it down the drain. And check the bite occasionally for at least two weeks to see if a rash forms. If it does, you've been infected and should seek treatment promptly.

The rash appears at the bite location from two days to a few weeks after the bite. It usually starts as a small red spot that expands as the spirochetes spread beyond the bite. Most commonly, the rash develops into a reddish circle or oval about two to three inches in diameter. It fades with or without treatment after a few weeks.

Much larger rashes - anywhere from 6 to 20 inches in diameter - may also occur, especially on the back. Despite their size, large rashes may be easy to miss because they're often very faint.

Other variants include a rash with a red perimeter and a clear center and the so-called bull's-eye rash, which consists of several concentric red rings. Rashes may vary in shape, depending on where they occur on the body. Frequent sites are the thigh, groin, and armpits. People often develop a rash in more than one place.

Early symptoms may include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Since tick bites don't always produce a rash, those symptoms alone may warrant a medical check for possible Lyme infection - especially if they occur in summer and you live in an area that is endemic for Lyme disease.

Without treatment, the spirochetes usually multiply and the disease progressively worsens. The second stage, occurring within weeks to months of the bite, may affect the heart and nervous system. Third is the chronic arthritic stage, which begins up to a year or more after the bite.

## ATTACHMENT K

# PRESSURIZED INJECTION PROCEDURE

## STANDARD OPERATION GUIDELINES FOR PRESSURIZED INJECTIONS AND ASSOCIATED EQUIPMENT

These guidelines contain general safety requirements for pressurized injection operations and use of associated equipment.

### RESPONSIBILITY AND APPLICABILITY

The ISOTEC Project and Site Manager is responsible for ensuring that employees of ISOTEC and of firms contracted by ISOTEC comply with these guidelines.

### PROCESS DESCRIPTIONS/ EQUIPMENT

**ISOTEC** will employ the use of either permanent injection wells or temporary direct-push injection points to install numerous pathways in the test area. ISOTEC will use a pneumatic diaphragm pump to deliver their reagents into these points.

Standard Operating Procedure for Injections using A DIAPHRAGM pump

- Base of diaphragm pump must be fastened to a structural support to prevent vibration,
- Connect transfer hoses. Hose connections, valves, etc. on discharge side of pump must be reinforced and rated for the maximum pressure to be used,
- Approximately 10 gallons of water will be used for test run to confirm proper operation of pump and equipment leak test,
- Hose connections at reagent suction point, pump inlet, pump discharge, and injection point must be "double-valved" (i.e., two gate valves in succession),
- Inspect transfer lines/hoses, valves, and all connections for wear, damage, and security,
- Transfer hoses on the pressure discharge side must be secured to prevent "spraying" in the event of line breach,
- Connect air compressor lines and pressure regulators to diaphragm pumps; air line ball valve and pump pressure regulator valve should be closed (i.e., no pressure),
- Start air compressor, adjust compressor pressure regulator to 120 psi,
- Open ball valve on diaphragm pump air line and increase pressure on pump regulator until pumping begins,
- Confirm operation/leak check of diaphragm pump and transfer hoses using water only,
- Adjust to minimum pressure required to sustain continuous pump flow varying from 25 psi (min.) to 120 psi (max.),
- Upon successful operation/leak check, begin injection of reagents,
- Monitor ground in injection point area, immediately discontinue injection if material surfaces by closing the ball valve located before the diaphragm pump pressure regulator,
- At the completion of a reagent injection cycle, a sufficient volume of water will be injected to rinse the pump, transfer lines and injection point apparatus.
- When finished with an injection sequence, the air compressor will be shut off. The diaphragm pump(s) will continue to operate until the air compressor pressure supply is depleted.
- All exclusion area injection equipment will be disassembled and decontaminated as required.

# ATTACHMENT H

## MATERIAL SAFETY DATA SHEETS (MSDS)

# MATERIAL SAFETY DATA SHEET

## SECTION 1 - MATERIAL IDENTIFICATION

PRODUCT NAME ISOTEC[SM] Catalyst Series 4260
Component-A Powder Mix

ISOTEC[SM] is a registered service mark of In-Situ Oxidative Technologies, Inc.

MANUFACTURER TMC Chemicals, Inc.
P.O. Box 5430
Parsippany, NJ 07054

EMERGENCY TELEPHONE NUMBER(S) (973) 560-1400 (Northern NJ)
(609) 275-8500 (Southern NJ)

DATE PREPARED: January 1996 (Revised, 1/04)

| | |
|---|---|
| C.A.S. CHEMICAL NAME | Not Applicable (Mixture) |
| SYNONYMS | None |
| CHEMICAL FAMILY | Not Applicable |
| EMPIRICAL FORMULA | MIXT |
| INTENDED USE Catalyst | |

*Catalyst is a mixture that has been tested as a whole in determining hazards*

## SECTION 2 - INGREDIENTS

| CAS Number and Chemical Name | % | OSHA ACGIH PEL/TLV-TWA ppm - mg/M$^3$ | ACGIH STEL-TWA ppm - mg/M$^3$ |
|---|---|---|---|
| Catalyst is a trade secret | 100 | OSHA = None<br>NIOSH = 1 mg/m$^3$ | Oral LD50<br>Not Evaluated<br>(1510 mg/m$^3$ Rat) |

Catalyst is not listed as a known or suspect carcinogen by NTP or IARC

## SECTION 3 - HEALTH HAZARDS

EMERGENCY OVERVIEW

*Applicable properties are relevant to the mixture as a whole when certain proprietary ingredients present at their highest concentrations. Please note that the effects are normally lower for a typical mixture with smaller concentrations of these ingredients present.*

ROUTES OF EXPOSURE
Inhalation, Skin Contact, Ingestion

EXPOSURE STANDARDS
See Section 2 for exposure standards on ingredients

HEALTH HAZARDS
May irritate eyes, skin and mucous membranes; harmful if inhaled or swallowed

TARGET ORGANS
Eyes, respiratory tract

SIGNS AND SYMPTOMS OF EXPOSURE (Acute and Chronic effects)
Irritant to mucous membranes and upper respiratory tract; may cause eye and skin irritation, stomach ache, breathing difficulty

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
None known

IRRITATION EFFECTS DATA
Not Evaluated

ACUTE TOXICITY EFFECTS DATA
Oral LD50 - Not Evaluated (1510 $mg/m^3$ Rat)
Dermal LD50 - Not Evaluated

OTHER ACUTE EFFECTS
Not Evaluated

CHRONIC/SUBCHRONIC DATA
Not Evaluated

## SECTION 4 - FIRST AID

EYE CONTACT

Hold eyelids apart and immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

SKIN CONTACT

Wash affected area immediately with soap and water.

INHALATION

In case of inhalation or suspected inhalation, move patient at once to fresh air and call a physician. Keep patient absolutely quiet. If breathing has stopped or is labored, give assisted respiration (e.g., mouth-to-mouth). Supplemental oxygen may be indicated.

INGESTION

If swallowed, call a physician immediately. Induce vomiting or remove stomach contents by gastric suction only as directed by medical personnel. Wash mouth with plenty of water. Never give anything by mouth to an unconscious person.

## SECTION 5 - FIRE AND EXPLOSION DATA

CHARACTERISTICS:

| | |
|---|---|
| Flash Point | None |
| Upper Explosive Limit (UEL) | Not Applicable |
| Lower Explosive Limit (LEL) | Not Applicable |
| Auto-ignition Temperature | Not Applicable |
| Flash Point Method(s) | None |
| Unusual Fire & Explosion Hazards | None |
| Fire Hazard Classification (OSHA/NFPA) | None |

EXTINGUISHING MEDIA

In case of fire, flood with water.

SPECIAL FIRE FIGHTING PROCEDURES

Firefighters should wear butyl rubber boots, gloves, body suit and self-containing breathing apparatus. Use water spray to cool all affected containers. Avoid skin contact. Contain runoff water in dikes. Prevent stream contamination. Expended liquids from fire fighting should be diverted to an active sanitary sewer line.

UNUSUAL FIRE AND EXPLOSION HAZARDS

May emit sulfur oxide vapors under burning conditions. See Section 6 for hazardous combustion products.

# MATERIAL SAFETY DATA SHEET

## SECTION 6 - REACTIVITY DATA

CHEMICAL STABILITY
Stable

INCOMPATIBILITIES
Avoid mixing powder with strong oxidizing agents and alkalies

CONDITIONS TO AVOID
Contact with combustible materials, heat

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Sulfur oxide vapors, such as $SO_2$ and $SO_3$

HAZARDOUS POLYMERIZATON
Will not occur

NFPA Reactivity Rating
None

## SECTION 7 - SPILL, LEAK AND WASTE DISPOSAL INFORMATION

CLEAN-UP PROCEDURES
Sweep up and repackage or place in receptacle for future disposal.

OTHER EMERGENCY ADVISE
Avoid eye and skin contact. Wear protective clothing including gloves, safety goggles, breathing mask and coveralls when handling. Stored materials should be placed in a dry and reasonably temperature area, preferably below 75°F.

WASTE DISPOSAL
Remove to properly designated landfill. Observe all federal, state and local environmental regulations.

ENVIRONMENTAL EFFECTS
Data not yet available

## SECTION 8 - PERSONAL PROTECTION/EXPOSURE CONTROLS

EYE PROTECTION

Splash proof goggles.

HAND PROTECTION

Impermeable gloves made of Nitrile or rubber.

RESPIRATORY PROTECTION

Wear appropriate NIOSH/MSHA-approved full-face respirator with HEPA cartridges for protection against excessive particulate matter/ dust

PROTECTIVE CLOTHING

Long sleeved clothing (e.g. cotton coveralls or Tyvek). Do not wear short trousers

ENGINEERING CONTROLS

Avoid drafts that may disperse material beyond the work area. Use light water spray for dust suppression

WORK AND HYGIENIC PRACTICES

Provide readily accessible eye wash stations. Wash at the end of each work shift and before eating, smoking or using the toilet

## SECTION 9 - STORAGE AND HANDLING

STORAGE

Keep container tightly closed and dry. Keep in a cool place. Do not store next to strong oxidizers (e.g. hydrogen peroxide). Store approximately 10 feet away from oxidizers.

HANDLING

Do not inhale. Avoid contact with skin and eyes.

OTHER PRECAUTIONS:

Carefully read instructions before handling this material. Be sure that all engineering and personal protective equipment is in working order.

# MATERIAL SAFETY DATA SHEET

## SECTION 10 - PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL FORM | Powder |
| COLOR | Light Green |
| ODOR | None |

TYPICAL PHYSICAL DATA

| | |
|---|---|
| pH (10% aqueous) | 3.5-3.9 |
| VAPOR PRESSURE (mm Hg) | 0 |
| VAPOR DENSITY (Air = 1) | Not Applicable |
| BOILING POINT | Decomposition at 300°C |
| FREEZING/MELTING POINT | Not Applicable |
| SOLUBILITY IN WATER | 57% by weight @ 158° |
| SPECIFIC GRAVITY (Water = 1) | 1.899 @ 14°/ 8°C |
| EVAPORATION RATE (Butylacetate = 1) | Non Volatile |
| VISCOSITY (CPS) | Not Evaluated |

## SECTION 11 - TRANSPORTATION INFORMATION

| | |
|---|---|
| UN No. 1481 | |
| DOT SHIPPING NAME | No Data |
| IMO SHIPPING NAME | No Data |
| LATA SHIPPING NAME | No Data |

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# MATERIAL SAFETY DATA SHEET

## SECTION 1 – MATERIAL IDENTIFICATION

PRODUCT NAME ISOTEC[SM] Catalyst-4260
Chelopolychempremox-B

ISOTEC is a registered servicemark of In-Situ Oxidative Technologies, Inc.

MANUFACTURER TMC Chemicals, Inc.
P.O. Box 5430
Parsippany, NJ 07054

EMERGENCY TELEPHONE NUMBER(S) (973) 560-1400 (Northern NJ)
(609) 275-8500 (Southern NJ)

DATE PREPARED: January 1996 (revised, 1/04)

| | |
|---|---|
| C.A.S. CHEMICAL NAME | Mixture |
| SYNONYMS | None |
| CHEMICAL FAMILY | Not Applicable |
| EMPIRICAL FORMULA | MIXT |
| INTENDED USE | Catalyst |

## SECTION 2 - INGREDIENTS

| CAS Number and Chemical Name | % | OSHA ACGIH PEL/TLV-TWA ppm - mg/M$^3$ | ACGIH STEL-TWA ppm - mg/M$^3$ |
|---|---|---|---|
| Catalyst is a trade secret | 100 | Not established | Not established |

*This product is not listed as a known or suspect carcinogen by NTP or IARC*

## SECTION 3 - HEALTH HAZARDS

EMERGENCY OVERVIEW

*Applicable properties are relevant to the mixture as a whole when certain proprietary ingredients present at their highest concentrations. Please note that the effects are normally lower for a typical mixture with smaller concentrations of these ingredients present.*

ROUTES OF EXPOSURE

Inhalation, Skin Contact, Ingestion

EXPOSURE STANDARDS

See Section 2 for exposure standards on ingredients

HEALTH HAZARDS

Eye and skin irritant, may be harmful if inhaled or swallowed

TARGET ORGANS

Kidney, Ureter, Bladder

SIGNS AND SYMPTOMS OF EXPOSURE (Acute and Chronic effects)

Irritant to mucous membranes and upper respiratory tract; may cause eye or skin irritation

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

None Reported

IRRITATION EFFECTS DATA

Not Evaluated

ACUTE TOXICITY EFFECTS DATA

Oral LD50 - Not Evaluated (2150 mg/kg Rat)
Dermal LD50 - Not Evaluated

OTHER ACUTE EFFECTS

Not Evaluated

CHRONIC/SUBCHRONIC DATA

Not Evaluated

## SECTION 4 - FIRST AID

EYE CONTACT

Hold eyelids apart and immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

SKIN CONTACT

Wash affected area immediately with soap and water.

INHALATION

In case of inhalation or suspected inhalation, move patient at once to fresh air and call a physician. Keep patient absolutely quiet. If breathing has stopped or is labored, give assisted respiration (e.g., mouth-to-mouth). Supplemental oxygen may be indicated.

INGESTION

If swallowed, call a physician immediately. Induce vomiting or remove stomach contents by gastric suction only as directed by medical personnel. Wash mouth with plenty of water. Never give anything by mouth to an unconscious person.

## SECTION 5 - FIRE AND EXPLOSION DATA

CHARACTERISTICS:

| | |
|---|---|
| Flash Point | Not Evaluated |
| Upper Explosive Limit (UEL) | Not Applicable |
| Lower Explosive Limit (LEL) | Not Applicable |
| Autoignition Temperature | Not Evaluated |
| Flash Point Method(s) | Not Specified |
| Fire Hazard Classification (OSHA/NFPA) | None |

EXTINGUISHING MEDIA

In case of fire, flood with water.

SPECIAL FIRE FIGHTING PROCEDURES

Firefighters should wear butyl rubber boots, gloves, body suit and self containing breathing apparatus. Use water spray to cool all affected containers. Avoid skin contact. Contain runoff water in dikes. Prevent stream contamination. Expended liquids from fire fighting should be diverted to an active sanitary sewer line.

UNUSUAL FIRE AND EXPLOSION HAZARDS

May emit oxides of carbon, nitrogen, and sulfur under burning conditions.

## SECTION 6 - REACTIVITY DATA

CHEMICAL STABILITY
Stable

INCOMPATIBILITIES
Strong Oxidizing Agents. Do not mix with pure oxidizing agents

CONDITIONS TO AVOID
Contact with combustible materials, heat

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Oxides of carbon, nitrogen and sulfur.

HAZARDOUS POLYMERIZATON
Will not occur

NFPA Reactivity Rating
None

## SECTION 7 - SPILL, LEAK AND WASTE DISPOSAL INFORMATION

CLEAN-UP PROCEDURES
Do not mix combustible substances (e.g., sawdust) with spilled material. Do not raise dust while sweeping.

OTHER EMERGENCY ADVISE
Avoid eye and skin contact. Wear protective clothing.

WASTE DISPOSAL
Sweep up, place in a bag and hold for waste disposal. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state and local environmental regulations.

ENVIRONMENTAL EFFECTS
Data not yet available

## SECTION 8 - PERSONAL PROTECTION/EXPOSURE CONTROLS

EYE PROTECTION

Splash-proof goggles.

HAND PROTECTION

Impermeable gloves made of Nitrile or rubber.

RESPIRATORY PROTECTION

Wear appropriate NIOSH/MSHA-approved full-face respirator with HEPA cartridges for protection against particulate matter/ dust.

PROTECTIVE CLOTHING

Long sleeved clothing such as cotton coveralls or Tyvek.

ENGINEERING CONTROLS

Avoid drafts that may disperse material beyond the work area. Use light water spray for dust suppression.

WORK AND HYGIENIC PRACTICES

Provide readily accessible eyewash stations. Wash at the end of each work shift and before eating, smoking or using the toilet.

## SECTION 9 - STORAGE AND HANDLING

STORAGE

Keep container tightly closed and dry. Keep in a cool place. Do not store near strong oxidizers (e.g. hydrogen peroxide). Store at least 10 feet away.

HANDLING

Do not inhale. Avoid contact with skin and eyes.

OTHER PRECAUTIONS:

Carefully read instructions before handling this material. Be sure that all engineering and personal protective equipment is in working order.

# MATERIAL SAFETY DATA SHEET

## SECTION 10 - PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL FORM | Powder |
| COLOR | White |
| ODOR | None |

TYPICAL PHYSICAL DATA

| | |
|---|---|
| pH (10% aqueous solution) | 7.9-8.5 |
| VAPOR PRESSURE (mm Hg) | Non-Volatile |
| VAPOR DENSITY (Air = 1) | Non-Volatile |
| BOILING POINT | Not Applicable |
| FREEZING/MELTING POINT | > 300°C |
| SOLUBILITY IN WATER | Soluble |
| SPECIFIC GRAVITY (Water = 1) | Not Evaluated |
| EVAPORATION RATE (Butylacetate = 1) | Non-Volatile |
| VISCOSITY (CPS) | Not Evaluated |

## SECTION 11 - TRANSPORTATION INFORMATION

| | |
|---|---|
| UN No. 1481 | |
| DOT SHIPPING NAME | No Data |
| IMO SHIPPING NAME | No Data |
| LATA SHIPPING NAME | No Data |

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# MATERIAL SAFETY DATA SHEET

## SECTION 1 - MATERIAL IDENTIFICATION

PRODUCT NAME ISOTEC[SM] Catalyst-4260
Component C

ISOTEC[SM] is a registered servicemark of In-Situ Oxidative Technologies, Inc.

MANUFACTURER TMC Chemicals, Inc.
P.O. Box 5430
Parsippany, NJ 07054

| | |
|---|---|
| EMERGENCY TELEPHONE NUMBER(S) | (973) 560-1400 (Northern NJ)<br>(609) 275-8500 (Southern NJ) |
| DATE PREPARED: | January 1996 (Revised 1/04) |
| C.A.S. CHEMICAL NAME | Mixture |
| SYNONYMS | None |
| CHEMICAL FAMILY | Not Applicable |
| EMPIRICAL FORMULA | Not Applicable |
| INTENDED USE | Catalyst |

*Catalyst is a mixture that has been tested as a whole in determining hazards*

## SECTION 2 - INGREDIENTS

| CAS Number and Chemical Name | % | OSHA ACGIH PEL/TLV-TWA ppm - mg/M$^3$ | ACGIH STEL-TWA ppm - mg/M$^3$ |
|---|---|---|---|
| Catalyst is a trade secret | 100 | 2 mg/cuM | 2 mg/cuM |

This material has not been listed as a known or suspect carcinogen by NTP or IARC

## SECTION 3 - HEALTH HAZARDS

EMERGENCY OVERVIEW

*Applicable properties are relevant to the mixture as a whole when certain proprietary ingredients present at their highest concentrations. Please note that the effects are normally lower for a typical mixture with smaller concentrations of these ingredients present.*

ROUTES OF EXPOSURE
Inhalation, Skin Contact, Eye Contact, Ingestion

EXPOSURE STANDARDS
See Section 2 for exposure standards on ingredients

HEALTH HAZARDS
Eye and skin irritant, harmful if inhaled or swallowed

TARGET ORGANS
Skin, Eyes, respiratory tract

SIGNS AND SYMPTOMS OF EXPOSURE (Acute effects)
Irritant to mucous membranes; causes burning in eyes and skin

SIGNS AND SYMPTOMS OF EXPOSURE (Possible longer term effects)
Red and/or burning skin; irritated eyes

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
Not Evaluated

IRRITATION EFFECTS DATA
Not Evaluated

ACUTE TOXICITY EFFECTS DATA
Oral LD50 - Not Evaluated
Dermal LD50 - Not Evaluated

OTHER ACUTE EFFECTS
Not Evaluated

CHRONIC/SUBCHRONIC DATA
Not Evaluated

## SECTION 4 - FIRST AID

EYE CONTACT

Hold eyelids apart and immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

SKIN CONTACT

Remove contaminated clothing. Wash affected area immediately with soap and water.

INHALATION

In case of inhalation or suspected inhalation, move patient at once to fresh air and call a physician. If breathing has stopped or is labored, give assisted respiration (e.g., mouth-to-mouth). Supplemental oxygen may be indicated.

INGESTION

If swallowed, call a physician immediately. **Do not induce vomiting!** Give large quantities of water or milk. Wash mouth with plenty of water. Never give anything by mouth to an unconscious person.

## SECTION 5 - FIRE AND EXPLOSION DATA

CHARACTERISTICS:

| | |
|---|---|
| Flash Point | Not Evaluated |
| Upper Explosive Limit (UEL) | Not Evaluated |
| Lower Explosive Limit (LEL) | Not Evaluated |
| Autoignition Temperature | Not Evaluated |
| Flash Point Method(s) | Not Specified |
| Fire Hazard Classification (OSHA/NFPA) | None |

EXTINGUISHING MEDIA

This product is not flammable.

SPECIAL FIRE FIGHTING PROCEDURES

Use NIOSH-approved self-contained breathing apparatus and complete protective clothing when fighting chemical fires. Use water spray to cool all affected containers. Avoid skin contact. Contain runoff water in dikes. Prevent stream contamination. Expended liquids from fire fighting should be diverted to an active sanitary sewer line.

UNUSUAL FIRE AND EXPLOSION HAZARDS

May react with some metals to form flammable hydrogen gas. Direct contact with water will cause an exothermic reaction.

## SECTION 6 - REACTIVITY DATA

CHEMICAL STABILITY

Stable

INCOMPATIBILITIES

Contact with organics and concentrated acids may cause violent reactions. Contact with carbohydrates may form carbon monoxide. Also incompatible with some metals, explosives, and organic peroxides.

CONDITIONS TO AVOID

None known.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS

Product will react with some metals forming flammable hydrogen gas.

HAZARDOUS POLYMERIZATON

Will not occur

NFPA Reactivity Rating

None

## SECTION 7 - SPILL, LEAK AND WASTE DISPOSAL INFORMATION

CONTAINMENT/CLEAN-UP TECHNIQUES

(Small spills) Sweep or shovel spilled material into containers. Neutralize remainder of spill with dilute acid. After removal, flush contaminated area thoroughly with a water spray.

(Large spills) Contain spill with absorbent or chemical boom and ventilate area. Only trained personnel to enter spill area. Collect spill in a waste container or remove with a vacuum truck. Prevent spill from entering natural watercourses. Neutralize remainder of spill with dilute acid and flush area thoroughly with water spray.

OTHER EMERGENCY ADVICE

Avoid eye and skin contact. Wear protective clothing.

WASTE DISPOSAL

Aqueous solutions should be neutralized with a dilute acid or large volume of water and directed to septic drain. Dry material can be disposed of in an appropriate hazardous material container. Observe all federal, state and local environmental regulations. Check with local sewer authority for compliance with waste discharge.

ENVIRONMENTAL EFFECTS

Limited information is available on the environmental fate and effects of this product. Laboratory toxicity data indicate that this chemical is moderately toxic to aquatic and terrestrial organisms. Primary mode of action is due to the corrosive nature of this chemical and its tendency to increase pH in poorly buffered environments. Aquatic organisms become increasingly stressed as pH exceeds 9, with many species being intolerant of pH levels in excess of 10. Increased pH due to the introduction of this chemical may lead to the precipitation of essential micronutrients. Exposed terrestrial species would be subject to skin irritation and burns due to the corrosive nature of this chemical.

## SECTION 8 - PERSONAL PROTECTION/EXPOSURE CONTROLS

EYE PROTECTION

Splash-proof chemical safety goggles.

HAND PROTECTION

Impermeable gloves made of neoprene or rubber.

RESPIRATORY PROTECTION

If engineering controls do not maintain airborne concentrations below recommended limits, wear appropriate NIOSH/MSHA-approved full-face respirator.

PROTECTIVE CLOTHING

Long sleeved clothing such as cotton coveralls or Tyvek.

ENGINEERING CONTROLS

Good general ventilation should be used (10 air changes/hour). Avoid drafts that may disperse material beyond the work area.

WORK AND HYGIENE PRACTICES

Provide readily accessible eye wash stations and emergency shower or equivalent. Wash at the end of each work shift and before eating, smoking or using the toilet.

## SECTION 9 - STORAGE AND HANDLING

STORAGE & HANDLING

Keep container tightly closed. Keep in a cool, dry place. Store at least 10 feet away from acids. Do not inhale. Avoid contact with skin and eyes.

OTHER PRECAUTIONS:

Carefully read instructions before handling this material. Be sure that all engineering and personal protective equipment is in working order.

## SECTION 10 - PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| PHYSICAL FORM | Solid |
| COLOR | White to off-white |
| ODOR | None |
| | |
| TYPICAL PHYSICAL DATA | |
| | |
| pH | Strongly basic |
| VAPOR PRESSURE (mm Hg) | 42 |
| VAPOR DENSITY (Air = 1) | Not Applicable |
| BOILING POINT | 754° C |
| FREEZING/MELTING POINT | 159° C |
| SOLUBILITY IN WATER | 100% by weight @ 25°C |
| SPECIFIC GRAVITY (Water = 1) | 2.13 |
| EVAPORATION RATE (Butylacetate = 1) | Not Applicable |
| VISCOSITY (CPS) | Not Evaluated |

## SECTION 11 - TRANSPORTATION INFORMATION

| | |
|---|---|
| UN No. 1481 | |
| DOT SHIPPING NAME | No Data |
| | |
| IMO SHIPPING NAME | No Data |
| | |
| LATA SHIPPING NAME | No Data |

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Degussa

Degussa
Corporation

1369/055

*H202 35% F.G. 500 LB 55 GAL

041

MSDS # 1069 MATERIAL SAFETY DATA SHEET PAGE 1

Degussa Corporation
Chemical Group
65 Challenger Road, Ridgefield Park, NJ 07660
Non-Emergency Product Information: 1-201-641-6100
Emergency Only(Chemtrec): 1-800-424-9300

Revised: 7/09/98 Supersedes: 7/01/98

## I. PRODUCT INFORMATION

TRADE NAMES/SYNONYMS: Hydrogen Peroxide 20% to 52%
50% PERTRONIC TM 10 Grade H2O2

CHEMICAL NAME: Hydrogen Peroxide 20% to 52% by wt.in aqueous soloution

CAS NUMBER: 7722-84-1

CHEMICAL FAMILY: Inorganic Peroxide

CHEMICAL FORMULA: H2O2

This material is in compliance with the Toxic Substances Control Act.

## II. SUMMARY OF HAZARDS

DANGER! This product is a strong oxidizer which may release oxygen and promote the combustion of flammable material. May cause eye and skin irritation and/or burns. May cause irritation to the respiratory tract.
See Section V for additional information on health hazards.

## III. HAZARDOUS COMPONENTS

| NAME | CAS NO. | % | EXPOSURE LIMITS PEL | TLV | OTHER |
|---|---|---|---|---|---|
| 1. Hydrogen Peroxide | 7722-84-1 | 20-52 | 1 ppm | 1 ppm | None |

No carcinogenicity designated by NTP, IARC, OSHA or others.

## IV. CHEMICAL AND PHYSICAL PROPERTIES

BOILING POINT: 220-237 F(104-113 C) VAPOR PRESSURE: 18 - 27 mmHg @ 85 F

MELTING POINT: Not applicable VAPOR DENSITY: 1.0 (Air = 1)

SOL. IN WATER: Complete SPECIFIC GRAVITY: 1.1 - 1.2 (H2O = 1)

pH: 0 - 3 EVAPORATION RATE: >1 (Butyl acetate=1)

APPEARANCE/ODOR: Clear, colorless liquid with a slightly pungent odor.

## V. HEALTH HAZARD DATA & FIRST AID PROCEDURES

The LD50 below corresponds to 50% Hydrogen Peroxide.

| | TOXICITY DATA | |
|---|---|---|
| CHEMICAL NAME | LD50 | LC50 |
| Hydrogen Peroxide | 800 mg/kg rat-orl | Not Available |

EYE CONTACT: Expected to cause eye irritation and/or burns. As a liquid, vapor or aerosol, this product could cause corneal damage which may occur several days later. In case of contact, flush eyes with plenty of water for at least 15 minutes. Call physician/ophtalmologist immediately.

SKIN CONTACT: Expected to cause skin irritation and/or burns. As the concentration and/or time of exposure increases, the extent of skin damage increases. In case of contact, flush skin with plenty of water while removing contaminated clothing. Call a physician if irritation persists or if burns occur.

SKIN ABSORPTION: May be harmful if absorbed through the skin. In the case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician if irritation persists or if burns occur.

INHALATION: Expected to be irritating to respiratory tract. If inhaled, remove to fresh air. If breathing is difficult, give oxygen. Call a physician if irritation persists.

INGESTION: Expected to cause burns to the gastrointestinal tract. If swallowed, do not induce vomiting. Give victim plenty of water to dilute stomach contents. Call a physician immediately. Never give anything by mouth to an unconscious person.

CHRONIC EFFECTS OF OVEREXPOSURE: No chronic (long term) effects are known for humans.

OTHER HEALTH EFFECTS: Medical conditions which may be aggravated by exposure to

this product include: Conjunctivitis of the eye, dermatitis of the skin, asthma and respiratory diseases.

## VI. EXPOSURE CONTROL MEASURES

EYE PROTECTION: Chemical goggles or face shield is required.

PROTECTIVE GLOVES: Wear chemical resistant neoprene, butyl rubber or vinyl gloves.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure limits listed in Section III by using engineering controls. If not feasible, use an approved supplied air respirator.

OTHER PROTECTION: If skin contact or contamination of clothing is possible, chemical resistant clothing must be worn.

VENTILATION: Provide general and/or local exhaust ventilation to maintain airborne levels below the exposure limits in Section III. Refer to "Industrial Ventilation" by ACGIH for a manual of recommended practices.

PERSONAL HYGIENE/ WORK PRACTICES: Establish good personal hygiene and work practices. Always wash hands and face before eating, drinking or smoking. Provide safety shower and eye wash station in work area.

## VII. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): Non-flammable

FLAMMABLE LIMITS LOWER: None UPPER: None

EXTINGUISHING MEDIA: Use water only to fight fires in which this material is involved. Apply vast amounts of water for cooling and dilution.

FIRE FIGHTING INSTRUCTIONS: Evacuate enclosed and surrounding areas. If smoke and fumes cannot be avoided, use proximity suit and self-contained breathing apparatus. In case of external fire, cool hydrogen peroxide container with plenty of water.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Spontaneous combustion can occur if allowed to remain in contact with oxidizable materials. Drying of product on clothing or combustible material may cause fire. Do not

allow temperature of storage tanks to rise above 100F (38C) Do not heat solution to concentrate of 74% or greater. Mixtures with combustible material may be explosive.

## VIII. REACTIVITY DATA

STABILITY: This product is stable only when cool and pure.

INCOMPATABILITY: Heavy metals, heavy metal ions/salts, rust, alkali, organic material, reducing agents, dust, and dirt.

HAZARDOUS PRODUCTS OF DECOMPOSITION: Can include oxygen, which will promote the combustion of flammable material.

HAZARDOUS POLYMERIZATION: Will not undergo hazardous polymerization.

## IX. ENVIRONMENTAL & DISPOSAL INFORMATION

GENERAL: CERCLA/SARA requires notification to the appropriate Federal state and local authorities of releases of hazardous or extremely hazardous quantities equal to or greater than the Reportable Quantities (RQs) in 40 CFR 302.4 and 40 CFR 355.

SARA Title 313 requires submissions of annual reports of releases of toxic chemicals that appear in 40 CFR 372. Components present in this product at a level which could require reporting under the statute are: *None*

ACTION TO TAKE FOR SPILLS/LEAKS: See Section V and VI for hazards and exposure controls. Eliminate source of spill and wash away with vast amounts of water. For an emergency, call CHEMTREC at 1-800-424-9300 for assistance.

DISPOSAL METHOD: Dispose of in accordance with all local, state and federal regulations. Contact Degussa at (334) 443-4000, ext. 4287 or ext. 4427 for assistance with disposal requirements.

## X. PRECAUTIONS FOR SAFE HANDLING, STORAGE AND USE

Store in original vented containers, in dry location and away from sun and heat or in dedicated bulk storage facilities. Protect from physical damage. Keep open flames, fire and sparks away from containers. Do not confine in unvented vessels or between closed valves. Never use

pressure to empty container and do not return product to the container after it has been removed.

## XI. SHIPPING INFORMATION

PRIMARY HAZARD: Oxidizer SECONDARY HAZARD: Corrosive

DOT SHIPPING NAME: Hydrogen Peroxide Aqueous Solutions

HAZARD CLASS: Oxidizer, (Div. 5.1) UN #: 2014 UN CLASS: 5 PG #: II

49 CFR REFERENCE: 173.202, 173.243

LABEL(S): OXIDIZER CORROSIVE

PLACARD(S): OXIDIZER

SHIPPING RESTRICTIONS: Air - forbidden in concentrations of 40% or greater. Below 40%: Pass. A/C-1 liter max./pkg. Cargo only-5 liters max./pkg.

AUTHORIZED CONTAINER TYPE(S): Drum - UN 3H1. IM 101 Portable Tanks.

## XII. ADDITIONAL INFORMATION

For additional product safety or product use information, contact the Product Manager at the address or phone number listed on page one.

## NOTICE

# APPENDIX B

# TAILGATE SAFETY MEETING FORM

# TAILGATE SAFETY MEETING FORM

**Date:** _____ **Time:** _____

**Scope of Work:** _____

_____

**Safety Topics Covered**

| | | |
|---|---|---|
| **Chemical Hazards**: | VOCs (benzene, chloroethane) | _____ |
| **Physical Hazards**: | Equipment | _____ |
| | Utilities | _____ |
| | Temperature stress | _____ |
| | Traffic | _____ |
| | Trip, slip, fall | _____ |
| | Weather conditions | _____ |
| **PPE**: | Review of Level D | _____ |
| **Special Equipment**: | | _____ |
| **Decontamination**: | | _____ |
| **Other**: | No smoking, eating or drinking in work areas | _____ |
| **Emergency Procedures**: | Review location of first aid kit, etc. | _____ |
| | Hospital route | _____ |

| **Name Printed** | **Signature** |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Meeting Conducted by: _____

# APPENDIX C

# JOB HAZARD ANALYSES

# Job Hazard Analysis

WORK PLACE DESCRIPITON/LOCATION: South Area Chemical Oxidation Work Plan; American Chemical Service NPL Site

ACTIVITY: Soil Sampling (DPT) PREPARED BY BY/DATE: Matt Mesarch (02/01/2004) REVIEWED BY/DATE: Scott Allen (2/18/04)

CERTIFCATION OF HAZARD ASSESSMENT AND REQUIRED PERSONAL PROTECTIVE EQUIPMENT (NAME/DATE):

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS | REQUIRED PERSONAL PROTECTIVE EQUIPMENT |
|---|---|---|---|
| General. Direct-Push Techology (DPT) drilling will be conducted to collect soil samples from the smear zone during the Bench and Field Application Studies. The drilling will be completed along Colfax Road southeast of the ACS facility.<br><br>1. Drill soil boring to smear zone via DPT methods.<br><br>2. At desired depth, soil samples are collected.<br><br>3. Abandon borehole and decontaminate equipment. | Chemical Hazards: Some (VOCs in soil and water, alconox used during decontamination)<br>Radiological: No known radiological hazards.<br>Biological Hazards: Minor (insects, plants)<br>Physical Hazards: Some (traffic on Colfax Road, pinch points on rig, loud noise, weather, temperature stress, heavy lifting) | Chemical: Level D PPE and air monitoring (PID measurements while drilling). Avoid dermal contact with soils, water, or decontamination materials.<br>Biological: Check for ticks, etc.<br>Physical: Utilize traffic spotter near Colfax Road and observe 5' safety buffer; use caution while near drill rig; only trained personnel can operate drill rig; dress appropriately for weather; watch for cold/heat stress; always wear PPE (hard hat/ear plugs); use proper technique when lifting heavy objects, use assistance when available. | Level D PPE<br>Hard hat<br>Steel-toe boots<br>Safety glasses with side shields<br>Latex or nitrile gloves<br>Hearing protection<br>Traffic vests around heavy machinery and high traffic areas |

| List of Equipment to be used: | Training: | Inspections: |
|---|---|---|
| DPT rig - only operated by subcontractor<br>Soil sampling equipment<br>PID<br>Drager Tubes (benzene) | All MWH personnel and subcontractors will be 40-hr HAZWOPER trained with up-to-date 8-hr refresher training, and have medical clearance to work.<br><br>At least one MWH personnel will be CPR and first aid trained. Contact the HSO for any training documents. | MWH requires contractors using equipment to perform a daily safety inspection. Equipment must be in good and safe operating condition, with any deficiencies identified and corrected, prior to use. Contractors may use their own inspection forms, or may ask for documentation assistance from MWH. Documentation must be available for audit. |


**References:**

1. US OSHA 29 CFR1910.132 Subpart I -*Personal Protective Equipment* (d) Hazard assessment and equipment selection.
2. Job Hazard Analysis. U.S. Dept of Labor/ OSHA 3071 1998 (revised).
3. US Army Corps of Engineers EM 385-1-1. 01.A.09 *Activity Hazard Analysis*.
4. MWH's Health and Safety Manual & Procedures


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# Job Hazard Analysis

WORK PLACE DESCRIPITON/LOCATION: South Area Chemical Oxidation Work Plan; American Chemical Service NPL Site

ACTIVITY: Groundwater Sampling PREPARED BY BY/DATE: Matt Mesarch (02/01/2004) REVIEWED BY/DATE: Scott Allen (2/18/04)

CERTIFCATION OF HAZARD ASSESSMENT AND REQUIRED PERSONAL PROTECTIVE EQUIPMENT (NAME/DATE):

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS | REQUIRED PERSONAL PROTECTIVE EQUIPMENT |
|---|---|---|---|
| General. Groundwater samples will be collected through Direct-Push Technology (DPT) rods and from temporary monitoring wells. The sampling will be completed along Colfax Road southeast of the ACS facility.<br><br>1. Set up equipment and sample bottles.<br>2. Purge well or borehole until stabilized.<br>3. Collect sample.<br>4. Disassemble equipment. | Chemical Hazards: Some (VOCs in soil and water, alconox used during decontamination)<br>Radiological: No known radiological hazards.<br>Biological Hazards: Minor (insects, plants)<br>Physical Hazards: Some (traffic on Colfax Road, pinch points on rig, loud noise, weather, temperature stress, heavy lifting) | Chemical: Level D PPE and air monitoring (PID measurements while drilling.) Avoid dermal contact with soils, water, or decontamination materials.<br>Biological: Check for ticks, etc.<br>Physical: Utilize traffic spotter near Colfax Road and observe 5' safety buffer; use caution while near drill rig; only trained personnel can operate drill rig; dress appropriately for weather; watch for cold/heat stress; always wear PPE (hard hat/ear plugs); use proper technique when lifting heavy objects, use assistance when available. | Level D PPE<br>Hard hat<br>Steel-toe boots<br>Safety glasses with side shields<br>Latex or nitrile gloves<br>Hearing protection<br>Traffic vests around heavy machinery and high traffic areas |

| List of Equipment to be used: | Training: | Inspections: |
|---|---|---|
| DPT rig - only operated by subcontractor<br>Groundwater sampling equipment<br>PID<br>Drager Tubes | All MWH personnel and subcontractors will be 40-hr HAZWOPER trained with up-to-date 8-hr refresher training, and have medical clearance to work.<br><br>At least one MWH personnel will be CPR and first aid trained. Contact the HSO for any training documents. | MWH requires contractors using equipment to perform a daily safety inspection. Equipment must be in good and safe operating condition, with any deficiencies identified and corrected, prior to use. Contractors may use their own inspection forms, or may ask for documentation assistance from MWH. Documentation must be available for audit. |


**References:**

1. US OSHA 29 CFR1910.132 Subpart I -*Personal Protective Equipment* (d) Hazard assessment and equipment selection.
2. Job Hazard Analysis. U.S. Dept of Labor/ OSHA 3071 1998 (revised).
3. US Army Corps of Engineers EM 385-1-1. 01.A.09 *Activity Hazard Analysis.*


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# Job Hazard Analysis

WORK PLACE DESCRIPITON/LOCATION: South Area Chemical Oxidation Work Plan; American Chemical Service NPL Site

ACTIVITY: Temp. Mon. Well Installation PREPARED BY BY/DATE: Matt Mesarch (02/01/2004) REVIEWED BY/DATE: Scott Allen (2/18/04)

CERTIFCATION OF HAZARD ASSESSMENT AND REQUIRED PERSONAL PROTECTIVE EQUIPMENT (NAME/DATE):

| PRINCIPAL STEPS | POTENTIAL HAZARDS | RECOMMENDED CONTROLS | REQUIRED PERSONAL PROTECTIVE EQUIPMENT |
|---|---|---|---|
| General. Direct-Push Technology (DPT) methods will be used to install temporary monitoring wells for groundwater monitoring. The drilling will be completed along Colfax Road southeast of the ACS facility.<br><br>1. Drill boring to desired depth.<br><br>2. At desired depth, well materials are installed. The well is then completed with sand pack and bentonite.<br><br>3. Remove remaining DPT rods and complete surface completion of well. | Chemical Hazards: Some (VOCs and petroleum hydrocarbons in soil and water, alconox used during decontamination)<br>Radiological: No known radiological hazards.<br>Biological Hazards: Minor (insects, plants)<br>Physical Hazards: Some (traffic on Colfax Road, pinch points on rig, loud noise, weather, temperature stress) | Chemical: Level D PPE and air monitoring (PID measurements while drilling.) Avoid dermal contact with soils, water, or decontamination materials.<br>Biological: Check for ticks, etc.<br>Physical: Utilize spotter near Colfax Road and observe 5' safety buffer; use caution while near drill rig; only trained personnel can operate drill rig; dress appropriately for weather; watch for cold/heat stress; always wear PPE (hard hat/ear plugs); always keep loose clothing away from rotating parts. | Level D PPE<br>Hard hat<br>Steel-toe boots<br>Safety glasses with side shields<br>Latex or nitrile gloves<br>Hearing protection<br>Traffic vests around heavy machinery and high traffic areas |

| List of Equipment to be used: | Training: | Inspections: |
|---|---|---|
| DPT rig - only operated by subcontractor<br>Bentonite (MSDS required)<br>Sand (for sand pack)<br>PID<br>Drager Tubes | All MWH personnel and subcontractors will be 40-hr HAZWOPER trained with up-to-date 8-hr refresher training, and have medical clearance to work.<br><br>At least one MWH personnel will be CPR and first aid trained. Contact the HSO for any training documents.. | MWH requires contractors using equipment to perform a daily safety inspection. Equipment must be in good and safe operating condition, with any deficiencies identified and corrected, prior to use. Contractors may use their own inspection forms, or may ask for documentation assistance from MWH. Documentation must be available for audit. |


**References:**

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4. MWH's Health and Safety Manual & Procedures


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## ACTIVITY HAZARD ANALYSIS
## ISOTEC PROJECT #800636

| Work Location: | Americal Chemical Service NPL, Griffith, Indiana | | |
|---|---|---|---|
| **Task Title:** | **In-Situ Chemical Oxidation - Modified Fenton's Reagent** | | |
| **Activity** | **Work Group** | **Hazards** | **Hazard Controls** |
| Mobilization to Site | Field Supervisor (FS), Project Manager (PM), Site Safety Officer (SSO), etc. | Site Security, Electric Power, Water Access | Locate and mobilize equipment in secure staging area near water and power sources. |
| | | | Review and walk work areas. |
| | | | Visitors must report to SSO or FS upon arrival. |
| | | | All personnel to receive site-specific training. |
| Reagent Preparation and Injection | FS and Field Technicians (FT) | Housekeeping – Slips/trips/falls | All sites will be kept clean and free of trash and other debris. |
| | | | All trash will be properly contained or staged daily and removed at the end of the event. |
| | | | Heavy items will not be manually lifted. |
| | | | Hoses and wires will be laid out to avoid tangling during injection activities. |
| | | Equipment Inspection | Prior to use all mechanical equipment (i.e. pumps, air compressors, generators, etc.) related to reagent preparation will be inspected daily by injection team. |
| | | | Fittings, valve, hoses, etc. will be checked prior to injection activities to ensure no loose connections, holes are observed. |
| | | Chemical Spills/Splashes | Chemical resistance clothing will be worn during oxidant transfer and preparation. |
| | | | Contain spill and use proper procedures to clean and dispose of chemicals. |
| | | | Change gloves frequently to avoid skin contact with chemicals. |
| | | | Safety glasses or full-face shells will be worn during oxidant transfer and preparation. |
| | | Particles and dusts (reagent preparation only) | Air quality will be monitored and respirators will be used as determined by the SSO. |
| | | Hand injury | Nitrile gloves will be worn during reagent preparation and injection. |
| | | Foot injury | Leather steel-toed and steel-shanked boots will be required. Chemical resistant slip over booties are also recommended. |

## ACTIVITY HAZARD ANALYSIS
## ISOTEC PROJECT #800636

| Work Location: | Americal Chemical Service NPL, Griffith, Indiana | | |
|---|---|---|---|
| **Task Title:** | **In-Situ Chemical Oxidation - Modified Fenton's Reagent** | | |
| **Activity** | **Work Group** | **Hazards** | **Hazard Controls** |
| Reagent Preparation and Injection | FS and FT | Fire | Turn off the generator/air compressor and allow it to cool down before refueling. |
| | | | Smoking is prohibited during refueling operation. |
| | | | Field trailer will contain a fire extinguisher. |
| | | | Fire extinguishers will be fully charged and inspected monthly by SSO. |
| | | | Fuels will be stored in appropriate containers. |
| | | Electrical | A Ground-Fault Circuit Interrupter (GFCI) will be required for generators and air compressors. |
| | | Severe weather | Reagent preparation and injection will stop when weather interferes with the safety of the field personnel. |
| | | Unauthorized operation | Only trained and authorized personnel will perform reagent preparation and injection activities. |
| Monitoring Well Sampling | FS and FT | Housekeeping – Slips/trips/falls | All sites will be kept clean and free of trash and other debris. |
| | | | All trash will be properly contained or staged daily and removed at the end of the event. |
| | | | Heavy items will not be manually lifted. |
| | | Equipment Inspection | Dedicated bailers will be inspected before each use and properly placed after each use. |
| | | | Sample container will be inspected and clearly labeled prior to sampling. |
| | | Hand injury | Nitrile gloves will be worn during sampling. |
| | | Foot injury | Leather steel-toed and steel-shanked boots will be required. |
| | | Severe weather | Sampling will stop when weather interferes with the safety of the field personnel. |
| | | | All field personnel will move out of the exclusion zone and take shelter in vehicles. |
| | | Unauthorized operation | Only trained and authorized personnel will perform sampling activities. |